

A REVIEW OF THE OSTEOLOGY AND PALEONTOLOGY OF TURKEYS (AVES: MELEAGRIDINAE)

By David W. Steadman¹

ABSTRACT: A study of the comparative osteology of specimens of all known species of living and extinct turkeys results in the recognition within the Meleagridinae of three genera: *Rhegminornis* Wetmore, *Proagriocharis* Martin and Tate, and *Meleagris* Linnaeus. *Meleagris* contains all diagnostic specimens of Blancan and younger ages, including both living species. The genera *Agriocharis* Chapman and *Parapavo* L. Miller are synonymized with *Meleagris*, and the species *Meleagris alta* Marsh and *Meleagris tridens* Wetmore are synonymized with *Meleagris gallopavo*. Evidence suggests that since at least Blancan times species in the lineage leading to *Meleagris gallopavo* have continuously occupied the southern United States. *Meleagris gallopavo* is absent from pre-Rancholabrean deposits.

Turkeys are large gallinaceous birds comprising the subfamily Meleagridinae of the family Phasianidae. All living and extinct species of this subfamily are known only from the New World. The fossil record of turkeys begins with *Rhegminornis calobates* Wetmore (1943) from the Lower Miocene (Hemingfordian) of Florida. This poorly known form has characters of both the Phasianinae and the Meleagridinae. A much larger unnamed species is represented by a single, rather undiagnostic, element from the Upper Miocene deposits in Virginia. The earliest certain turkey is *Proagriocharis kimballensis* Martin and Tate (1970) from the Upper Pliocene (Hemphillian) of Nebraska. Fossils of turkeys are relatively common in the Pleistocene, and several distinct species are recognized. Table 1 lists the fossil localities from which the specimens came that I examined in this study, while Figure 1 shows the geographical distributions of all species of extinct and living turkeys. The nomenclature used in Table 1, although based on evidence presented later in this paper, is given now to maintain consistency throughout the paper.

The stimulus of this review of the osteology and paleontology of turkeys was the discovery of large numbers of fossils from two Pleistocene sites in Florida: Inglis IA, of earliest Irvingtonian age; and Coleman IIA, late Irvingtonian in age. These specimens differed significantly from the living *Meleagris gallopavo* Linnaeus, and appeared to resemble several poorly known extinct forms previously unknown in eastern North America. The Inglis IA site, with approximately 1240 specimens representing a minimum of 44 individuals, and the Coleman IIA site, with approximately 320 elements representing a minimum of 17 individuals, provide the earliest adequate samples for an assessment of individual variation in fossil turkeys. These samples thus provide excellent standards for comparison with fossil turkeys from other localities that are typically more fragmentary and less numerous.

Prior to the Inglis and Coleman finds, large samples of fossil turkeys were known from only three species, all of Rancholabrean age. These species are *M. crassipes* L. Miller (1940), *M. californica* (L. Miller 1909), and *M. gallopavo*. The relationships between the later forms and the rarer, earlier species were poorly known. This paper compares all extinct and living species of turkeys, incorporating the large Irvingtonian samples in an effort to determine the relationships among the various meleagridines. A revised classification and possible phylogeny are proposed, based on these comparisons.

COMPARATIVE OSTEOLOGY

The study of fossil turkeys is complicated by their great sexual dimorphism, males being much larger than females. In the absence of qualitative osteological characters, a male of a small species might easily be confused with a female of a larger species. This problem is especially acute when a fossil site yields too few specimens to assess intraspecific size variation. This problem is largely alleviated, however, when enough fossils are recovered and two distinct size classes can be distinguished. This is the case at Inglis IA, Coleman IIA, Ichetucknee River, Rancho La Brea, and a few other sites. When specimens from a particular site are not qualitatively separable from two or more known species, the size of the fossils will determine the identification. This identification must be considered tentative because of the great intraspecific size variation. The large size differences found in turkey bones often make direct comparisons difficult, hence the extensive use of the term "relatively" in the following comparisons.

In undertaking the studies of comparative osteology, my original approach was to compare *Meleagris gallopavo* with *M.* (= *Agriocharis*) *ocellata* and *M.* (= *Parapavo*) *californica* and, by searching for generic characters, determine to which genus the Inglis IA and Coleman IIA specimens belonged. It soon became apparent, however, that diagnostic characters are few and quite subtle. A broader approach was then taken

¹ Paleoenvironmental Laboratory, Department of Geosciences, University of Arizona, Tucson, Arizona 85721.

in which each form was closely examined without reference to its supposed generic status.

With the notable exception of the work of Howard (1927), most characters of the various reputed genera and species of fossil turkeys have been based on only one or two individual specimens and do not hold when larger series of fossils or comparative material are examined. My findings often contradict previously published descriptions, the discrepancies being due largely, I believe, to the use of inadequate series of modern skeletons by earlier workers. The comparisons below are based on (1) the complete skeletons of 16 individuals of *Meleagris gallopavo* (8♂, 8♀) and 7 of *M. ocellata* (3♂, 4♀); (2) two partial tarsometatarsi of *Rhegminornis calobates*; (3) the holotype coracoid and three partial tarsometatarsi of *Proagriocharis kimbballensis*; (4) all of the material of *M. progenes* reported by Brodkorb (1964b); (5) the paratype tarsometatarsus of *M. leopoldi*; (6) a cast of the holotype humerus of *M. anza*; (7) all of the Inglis IA and Coleman IIA specimens; (8) one to nine specimens of each element of *M. californica* from Rancho La Brea; and (9) one to eight specimens of each known element of *M. crassipes* from San Josecito Cave. These statements in turn form the basis for comparing specimens from all other sites.

The comparative osteological data presented below are roughly quantified in Tables 2 and 3. These tables will be discussed more fully in the Systematics section. Figures 2 through 7, based on a specimen of *M. gallopavo osceola*, explain the various measurements of Tables 4 through 22. In Tables 4 through 22, an asterisk (*) follows a measurement taken from a slightly damaged specimen. The actual value of the measurements would range from 1 to 5 percent greater than the reported value if the specimens were not damaged. Measurements followed by two asterisks (**) were taken from more severely damaged specimens in which the actual value would range from 5 to 10 percent greater than the reported value. Means that include one or more of these measurements are also followed by an asterisk. Measurements followed by "A" are careful approximations of the actual value.

CRANIUM

Howard 1927: Pls. 1, 2.

1. The interfrontal depression (Howard 1927: Pl. 1, Fig. 4e) is usually shallower in *M. ocellata* than in Inglis and Coleman specimens, *M. californica*, or *M. gallopavo*. This contradicts Howard (1927), who reported a greater depression in *M. californica* than in *M. gallopavo*, and a variable depth in *M. ocellata*.

2. The supraorbital processes of the frontals in ventral view are even with or lateral to the postorbital process in *M. ocellata*; in other forms they do not extend to the postorbital process. Inglis specimens are damaged in this area. This contradicts Howard (1927), who reported a similar amount of flaring of the supraorbital process in *M. californica* as in *M. ocellata*, with a lesser amount in *M. gallopavo*.

3. The amount of tapering as the frontals approach parietals in dorsal view (Howard 1927: Pl. 1, Figs. 1-4) is usually greater in *M. ocellata* than in Coleman fossils or *M. gallopavo*; in Inglis fossils and *M. californica* it may resemble any of the above forms. Howard (1927) also noted more tapering in *M. ocellata* than in *M. gallopavo*, with *M. californica* being intermediate.

4. The frontals in lateral view are usually more protrudent above the parietals (Howard 1927: Pl. 2, Fig. 1d), resulting in a larger depression along the fronto-parietal suture, in *M. californica* and *M. gallopavo* than in Coleman specimens or *M. ocellata*. Inglis specimens may resemble any of the above. This contradicts Howard (1927), who noted the lack of a fronto-parietal depression in *M. gallopavo* and its presence in *M. californica* and *M. ocellata*, while reporting a higher relative parietal height (i.e., a lower relative frontal height) in *M. gallopavo* than in *M. ocellata*, both of which were said to be higher than in *M. californica*.

5. The foramen magnum is circular to oblong to triangular in *M. ocellata*, circular to oblong in *M. gallopavo*, and circular in Coleman and Inglis fossils and *M. californica*.

Howard (1927) found the cranium of *M. californica* to be more similar to that of *M. ocellata* than to that of *M. gallopavo*, while I find that *M. californica*, *M. gallopavo*, and *M. ocellata* are not consistently separable from each other by any cranial characters. Inglis and Coleman specimens closely resemble these three species, which are certainly not generically distinct on the basis of their crania.

PREMAXILLA

Howard 1927: Pl. 1.

1. The portion of the premaxilla anterior to the nares is usually narrower relative to its length in *M. gallopavo* than in *M. ocellata* or *M. californica*. *M. progenes* and Inglis specimens are damaged in this area. Howard (1928) and Brodkorb (1964b) found no individuals in which this character does not hold.

2. The premaxilla is relatively deeper in *M. gallopavo* than in other forms, as noted by Howard (1928) and Brodkorb (1964b).

3. Two ventral foramina immediately anterior to the choanae are present in *M. progenes* but are absent in other turkeys (Brodkorb 1964b). These are not to be confused with the pair (rarely more) of foramina located nearer to the anterior end than to the choanae, which may occur in any of the forms.

M. progenes is distinct from all other forms in character 3. Inglis fossils, *M. ocellata* and *M. californica*, are more similar to each other than to *M. gallopavo* in other characters of the premaxilla. Howard (1928) noted the greater resemblance of *M. californica* to *M. ocellata* than to *M. gallopavo*. However, none of the differences seen in the premaxilla of turkeys appear to be of generic value, particularly in view of the apparent evolutionary plasticity of bill morphology in certain birds.

MANDIBLE

1. The postarticular process is more expanded dorsoventrally, usually longer, and usually more laterally compressed in *M. ocellata* than in *M. gallopavo*. All fossil specimens examined are damaged in this area.

2. The rami are usually relatively larger in *M. ocellata* than in *M. gallopavo*. All fossil specimens examined are damaged in this area.

3. The mandibular foramen is usually relatively larger in *M. ocellata* than in *M. gallopavo*. All fossil specimens examined are damaged in this area.

4. The dentary at the mandibular symphysis is slightly narrower and usually slightly longer in *M. gallopavo* than in *M. ocellata*. The other forms are similar to *M. ocellata* in width,

but are shorter at the symphysis than either *M. ocellata* or *M. gallopavo*. Brodkorb (1964b) reported a narrower and longer dentary in *M. gallopavo* than in *M. progenes* or *M. ocellata*, but noted no variation in this character.

The mandible of *M. gallopavo* is usually distinct from that of *M. ocellata*. Fossil forms resemble *M. ocellata* more than *M. gallopavo*, but this is based only on character 4.

STERNUM

Howard 1927: Pls. 3, 4.

1. The manubrium is directed more dorsad in *M. gallopavo* than in other forms.

2. The manubrium in dorsal view is roughly triangular in shape in all turkeys, the sides of the triangle being more interrupted by a projection of the dorsal lip of the coracoidal sulcus in some Coleman specimens and in all *M. ocellata* than in other forms. This finding is consistent with that of Howard (1927, 1963), who found the shape of the manubrium in *M. californica* to be closer to that in *M. gallopavo* than in *M. ocellata*. However, I see no consistent difference in the width of any portion of the triangular area, which was reported by Howard (1963) to be wider in *M. gallopavo* and *M. ocellata* than in the Vallecito Creek specimen or *M. californica*.

3. The dorsal manubrial spine in lateral view is deeper in some *M. californica* and in all *M. gallopavo* than in Inglis or Coleman specimens or *M. ocellata*, in agreement with Howard (1963), who also found this projection to be shallower in the Vallecito Creek specimen than in *M. gallopavo*.

4. The ventral manubrial spine in lateral view is more rounded in *M. ocellata* than in *M. gallopavo*, in which it is pointed or squared. All fossils examined are damaged in this area.

5. The coracoidal sulcus is relatively shallower in *M. ocellata* than in *M. californica* or *M. gallopavo*, largely because of the lesser development of the ventral lip. Inglis specimens are usually similar to *M. ocellata*, while Coleman specimens are usually similar to *M. californica* or *M. gallopavo*.

6. The dorsal surface is usually more pneumatic in Inglis and Coleman specimens than in *M. californica*, *M. gallopavo*, or *M. ocellata*.

The sternum in *M. californica* resembles that of *M. gallopavo* more than that of *M. ocellata*, while Inglis and Coleman specimens resemble that of *M. ocellata* or *M. californica* more than that of *M. gallopavo*.

FURCULA

Fig. 8; Howard 1927: Pl. 5.

1. The rami in dorsal view are usually straighter in *M. gallopavo* than in *M. ocellata*. All fossils examined are damaged in this area. Howard (1927:5) found the rami to be "straight-sided" in *M. californica* and *M. gallopavo* and "curved outward" in *M. ocellata*, but she noted no variation in this character.

2. The dorsal surfaces of the rami in lateral view are slightly concave in *M. ocellata*; in *M. gallopavo* they may be straight, slightly concave, slightly convex, or sigmoid (slightly convex on the sternal end and slightly concave on the scapular end). All fossils examined are damaged in this area.

3. The rami are stoutest in Inglis fossils and narrowest in

M. gallopavo, with *M. californica* and *M. ocellata* being intermediate.

4. The rami near the symphysis are much more strongly flattened dorsoventrally, especially on the internal side, in *M. gallopavo* than in Inglis specimens or *M. californica*, with *M. ocellata* being intermediate.

5. The intermuscular lines convergent on the dorsal surface of the symphysis are much more distinct in Inglis specimens than in the other forms.

6. The intermuscular lines convergent on the ventral surface of the symphysis are usually more distinct in Inglis specimens and *M. californica* than in *M. gallopavo* or *M. ocellata*. This agrees with the findings of Howard (1927).

7. The hypocleidium is usually relatively shorter in *M. ocellata* than in *M. californica* or *M. gallopavo*. Inglis specimens are damaged in area.

8. The hypocleidium is much more expanded dorsoventrally in Inglis specimens than in *M. gallopavo* or *M. ocellata*, with *M. californica* being intermediate.

Howard (1927) regarded *M. californica* as generically distinct from *M. gallopavo* and *M. ocellata* on the basis of furcular characters, most of which are now seen to be only average differences. In characters 3, 5, and 8, the Inglis specimens differ from turkeys and resemble all species of Phasianinae examined.

CORACOID

Howard 1927: Pls. 6, 7.

1. The sternal facet is deeper internally and more tapered externally in most Coleman specimens, most *M. californica*, and in *M. ocellata* than in *Proagriocharis kimballensis*, Inglis specimens, or *M. gallopavo*. It is deep internally, but only slightly tapered externally, in *M. crassipes*. The specimen of *M. progenes* is damaged in this area.

2. The pneumatic foramen is extremely variable in relative size in all forms. Martin and Tate (1970:215) used the small pneumatic "fossa" (foramen?) of *P. kimballensis* to separate it from other turkeys, but all other forms may have an equally small pneumatic foramen.

3. The inner dorsal intermuscular line is curved farther away from the inner edge of the shaft in *P. kimballensis* than in other turkeys, as stated by Martin and Tate (1970). Howard (1927) correctly reported a similar amount of curvature in *M. gallopavo* and *M. californica*, but regarded this as being greater than in *M. ocellata*. Brodkorb (1964b) found this line to be curved farther away in *M. gallopavo* and *M. californica* than in *M. ocellata*, with *M. progenes* being intermediate. However, the individuals of each of these four species that I examined had a similar amount of curvature.

4. The inner dorsal intermuscular line is longer, extending to the sternal facet, in *M. crassipes* than in other forms, among which this line usually extends farther sternally in Inglis specimens. The specimens of *P. kimballensis* and *M. progenes* are damaged in this area.

5. The outer dorsal intermuscular line curves away from the outer edge of the shaft more in *M. progenes*, *M. crassipes*, and some *M. ocellata* than in other forms, contradicting Brodkorb (1964b), and Martin and Tate (1970), who reported more curvature in *M. progenes* and in *Proagriocharis*, respectively, than in other species.

6. The procoracoid may be of similar shape and extent in

all forms, contradicting Martin and Tate (1970), who found a more blunt procoracoid in *P. kimballensis* and *M. californica* than in *M. ocellata* or *M. gallopavo*.

7. The scapular facet is more rounded in *P. kimballensis*, some Inglis fossils, some *M. californica*, and some *M. crassipes* than in other turkeys, generally agreeing with Howard (1927) and Martin and Tate (1970).

8. The triosseal canal is deeper, producing a thinner neck, in *P. kimballensis* than in other turkeys, as stated by Martin and Tate (1970).

9. The humeral end in dorsal view may be inflected from the axis of the shaft similarly in all forms, contradicting Brodkorb (1964b), who reported more inflection in *M. progenes* than in *M. gallopavo* or *M. ocellata*.

10. The furcular facet is less protrudent from the neck (joining it more smoothly) in a few Coleman fossils, all *M. californica*, most *M. gallopavo*, and a few *M. ocellata* than in other forms. This contradicts Brodkorb (1964b), who found no overlap between *M. gallopavo* and *M. ocellata*, and Martin and Tate (1970:214–215), who stated that *P. kimballensis* “resembles *Agriocharis* [ocellata] and differs from *Parapavo* [californicus] and *Meleagris* [gallopavo] in that the head is raised above the inner surface of the neck.”

11. The furcular facet is notched in *P. kimballensis* and in Inglis and Coleman specimens, unnotched in *M. progenes*, and variable in all other forms. Howard (1927:6) overlooked this variability in reporting a “slight notch” in *M. californica*, which she considered to be most similar to *M. gallopavo*, and a “shallow notch farther removed from the interior border” in *M. ocellata*. Martin and Tate (1970:214) also found no variability and reported an “indistinct mid-ventral notch” in *P. kimballensis* and *M. californica* and the absence of the same in *M. gallopavo* and *M. ocellata*.

12. The furcular facet in medial view is shallower relative to the depth of the shaft in *M. crassipes* than in other forms. However, no consistent difference in its overall shape was noted, thus contradicting Howard (1927), who found it to be oval in outline in *M. gallopavo* and *M. californica*, and more rounded in *M. ocellata*.

13. The attachment of Lig. humero-coracoideum anterior inferior (“coracohumeral ligament”) may be similarly shaped in all turkeys, contradicting Martin and Tate (1970), who found it to be elongate in *P. kimballensis*, but triangular in other turkeys.

14. The attachment of Lig. humero-coracoideum anterior inferior has a distinct external border in all turkeys as stated by Howard (1927). Martin and Tate (1970) found it to be indistinct in *P. kimballensis*, but breakage obscures this character.

15. The external border of the attachment of Lig. humero-coracoideum anterior inferior reveals no consistent differences in any turkeys, contradicting Howard (1927), who found it to be more abrupt in *M. gallopavo* than in *M. ocellata*, with *M. californica* being intermediate.

16. The head is quite variable in shape in all forms, among which no consistent differences were found, thus disagreeing with Martin and Tate (1970), who reported the head to be oval in *P. kimballensis* and *M. californica* and not oval in *M. gallopavo* and *M. ocellata*.

17. The head in internal view is connected to the neck for a lesser distance in *P. kimballensis* than in *M. progenes*, *M.*

californica, *M. gallopavo*, or *M. ocellata*. *Meleagris crassipes* is intermediate. This contradicts Brodkorb (1964b), who found the head to have a less extensive connection to the neck, i.e., to be more “free” (Brodkorb 1964b) from the neck, in *M. progenes* and *M. ocellata* than in *M. gallopavo*. Inglis and Coleman fossils may be similar to any of the above forms, thus contradicting Martin and Tate (1970), who found the head connected to the neck less in *P. kimballensis* than in any other turkey.

Martin and Tate (1970) regarded the coracoid of *P. kimballensis* to be most similar to that of *M. ocellata*, with some resemblances to *M. californica*. They did not compare it qualitatively with *M. progenes*. The coracoid of *P. kimballensis* is most similar to that of the Inglis species and least similar to that of *M. progenes* and *M. californica*. The perceived lack of similarity between *P. kimballensis* and *M. progenes* may be at least partly due to the presence of only one fairly complete coracoid for each.

Brodkorb (1964b) found the coracoid of *M. progenes* to resemble that of *M. ocellata* more than that of *M. gallopavo*, while I find that *M. progenes* does not resemble either living species more than the other.

Coracoids of *M. gallopavo*, *M. ocellata*, and the Coleman species are very similar to each other. As with other elements, Inglis and Coleman specimens are closer to each other than to any other forms.

Howard (1927) considered the coracoid of *M. californica* generically separable from that of *M. gallopavo* and *M. ocellata*, with a closer resemblance to *M. gallopavo*. However, *M. californica* does not consistently differ from *M. gallopavo* or *M. ocellata* in any of the 15 characters listed.

SCAPULA

Fig. 9; Howard 1927: Pls. 7, 8.

1. The acromion is usually less pointed in Coleman specimens and *M. gallopavo* than in Inglis specimens, *M. ocellata*, or *M. californica*. The specimens of *M. progenes* are damaged in this area.

2. The furcular articulation in proximal view is usually deeper relative to the depth of the glenoid facet in *M. californica* and *M. ocellata* than in *M. progenes*, Inglis and Coleman specimens, or *M. gallopavo*, thus agreeing with Howard (1927).

3. The base of the shaft in dorsal view lacks a pneumatic foramen in *M. progenes* and in Inglis fossils, while Coleman fossils, *M. californica*, *M. gallopavo*, and *M. ocellata* have a pneumatic foramen of variable size. Wetmore (1944:98) reported a non-pneumatic scapula from Rexroad as “*Meleagrididae* sp.?” Brodkorb (1964b) tentatively referred two similar scapulae from Rexroad to *M. progenes*. Both authors noted that the Rexroad specimens differed from other known species of turkeys in this character.

The structure of the scapula is very similar in all forms that have a pneumatic foramen. In agreement with Howard (1927), I tentatively regard *M. californica* as being more similar to *M. ocellata* than to *M. gallopavo* in its scapular structure. Evolutionary implications of a foraminate versus non-foraminate scapula are discussed below in the section on evolution.

HUMERUS

Howard 1927: Pl. 2.

1. The head is similar in relative size in all forms, contradicting Howard (1927), who reported a more pronounced head in *M. californica* than in either living species.

2. The external tuberosity in males is usually less prominent in Inglis specimens and *M. crassipes* than in other forms. No differences were seen among females.

3. The head protrudes more anconally above the attachment of the deltoid muscle in *M. gallopavo* than in most Inglis or Coleman specimens, most *M. californica*, most *M. crassipes*, or most *M. ocellata*, partially contradicting Howard (1927), who reported greater protrusion in *M. gallopavo* than in *M. ocellata*, with *M. californica* being intermediate. The Vallecito Creek specimen is damaged in this area. Cracraft (1968) noted the variability of this character.

4. The capital groove is usually shallower and narrower in *M. ocellata* than in *M. gallopavo*. Other forms are similar to one or the other of the above species. The Vallecito Creek specimen is damaged in this area.

5. The medial rim of the pneumatic foramen has less proximal extension and is less clearly defined in some Coleman specimens and in all *M. ocellata* than in other forms.

6. The deltoid crest in lateral view usually has a more pointed apex in Inglis specimens and *M. ocellata* than in Coleman specimens, *M. californica*, *M. gallopavo* or *M. crassipes*. The Vallecito Creek specimen is damaged in this area.

7. The scar of *M. latissimus dorsi* is deeply depressed, especially its distal portion, in the Vallecito Creek specimen, usually in *M. gallopavo*, rarely in Inglis and Coleman specimens, *M. californica* and *M. ocellata*, and never in *M. crassipes*. It is never quite as deep in *M. ocellata* as in the Vallecito Creek specimen. This contradicts Howard (1927:8), who found it to be deep in *M. gallopavo* and shallow in *M. ocellata*, with *M. californica* resembling either species. She added, "A certain variability may be noted in the *Meleagris* [*gallopavo*] specimens and might be found in *Agriocharis* [*ocellata*] as well, were more material available." Howard (1963) found this muscle scar to be deep in the Vallecito Creek turkey, but did not consider it in determining the relationship of the fossil.

8. The shaft of the Vallecito Creek specimen in palmar or anconal view is more decurved than in other forms. However, this is probably an artifact of preparation, the specimen being broken into two pieces and glued together immediately distal to the scar of *M. latissimus dorsi*.

9. The brachial depression is deeper in the Vallecito Creek specimen than in other forms, possibly because of crushing, as stated by Howard (1963). It is nearly as deep in some Inglis and Coleman specimens and some *M. crassipes* as in the Vallecito Creek specimen.

10. The attachment of *M. pronator brevis* faces more palmar and less mediad in the Vallecito Creek specimen, most Inglis and Coleman specimens, and most *M. ocellata* than in *M. californica*, most *M. crassipes*, or most *M. gallopavo*. Howard (1963) noted no variation in reporting it to face more palmar in the Vallecito Creek specimen and *M. ocellata* than in *M. gallopavo*.

11. The prominence proximal to the attachment of the anterior articular ligament is usually sharper and more protrudent in Coleman and Inglis specimens than in other forms.

12. The attachment of the anterior articular ligament faces more laterad in the Vallecito Creek specimen (Howard 1963) and some Inglis specimens than in other forms.

13. The external condyle usually has a more pointed proximal end, especially in males, in Coleman specimens and *M. gallopavo* than in Inglis specimens, *M. crassipes*, or *M. ocellata*; and *M. californica* may be similar to any of the above forms. Although it is rounded in the Vallecito Creek specimen, it resembles certain individuals of all other forms, thus contradicting Howard (1963), who stated it to be more rounded in the Vallecito Creek specimen and *M. ocellata* than in *M. gallopavo* or *M. californica*.

14. The external condyle has the greatest medial curvature in those specimens with the most pointed external condyles (see character 13) and vice versa. This varies exactly as character 13.

The status of the Vallecito Creek specimen in characters 7, 8, and 9 is probably a result of its poor preservation, and these characters are, therefore, not included in Table 2. See page 143 for a further discussion of the Vallecito Creek humerus.

With the exception of the Vallecito Creek specimen, the least similarity in the humerus is seen between *M. gallopavo* and specimens from Inglis, and between *M. gallopavo* and *M. ocellata*. The most similarity is between *M. californica* and *M. crassipes*. Only in character 5, in which *M. ocellata* differs from all forms except some Coleman specimens, is an absolute distinction seen between any two forms represented by more than one specimen.

ULNA

Howard 1927: Pls. 1, 8.

1. The shaft in lateral view in males is more curved in *M. crassipes* and *M. ocellata* than in *M. californica* or *M. gallopavo*. Males from Inglis and Coleman may resemble any of the above forms. No difference is seen between females of any forms. Curvature of the shaft generally increases as ulnar size decreases.

2. Howard (1927) reported a more marked distal overhang and a narrower distal border in the external cotyla in *M. gallopavo* than in *M. ocellata* or *M. californica*, but this is not apparent to me.

I detected no other valid characters in the ulna, which appears to be the least diagnostic major limb bone in turkeys.

RADIUS

Howard 1927: Pl. 7.

1. The lateral ridge in the distal portion of the shaft is usually less distinct in *M. ocellata* than in other forms. Howard (1927) noted several differences in the shape and position of this ridge in *M. californica*, *M. ocellata*, and *M. gallopavo*, but these differences are not apparent to me.

2. The distal ligamental prominence is usually less protrudent mediad in *M. ocellata* than in other forms.

3. The distal tendinal groove is usually deeper, especially in its distal portion, and of greater proximal extent, in *M. ocellata* than in other forms. The condition in *M. ocellata* is similar to that stated by Howard (1927). However, she found this groove to be only a faint notch in *M. californica*, while being broad and shallow in *M. gallopavo*, characters which I find to be inconsistent.

Howard (1927) found the radius of *M. californica* to resemble that of *M. ocellata* more than that of *M. gallopavo*, but my data show that *M. californica* resembles *M. gallopavo* more than *M. ocellata* in this element. In fact, the radii from Inglis and Coleman and those of *M. californica*, *M. crassipes*, and *M. gallopavo* are alike in all three characters, and three average differences from all other known forms are seen in the radii of *M. ocellata*.

ULNARE

1. The ulnar base is wider relative to its length in Inglis fossils and *M. ocellata* than in *M. progenes* or *M. gallopavo*, contradicting Brodkorb (1964b), who found it relatively wider in *M. progenes* and *M. ocellata* than in *M. gallopavo*.

2. The ulnar base is not consistently different in height, contradicting Brodkorb (1964b), who found it high in *M. progenes* and *M. ocellata* and low in *M. gallopavo*.

CARPOMETACARPUS

Howard 1927: Pl. 9.

1. The inner trochlea is usually less notched in the proximal edge by Lig. internum ossi carpi ulnaris et metacarpi in *M. progenes* and *M. ocellata* than in other forms, contradicting Brodkorb (1964b), who reported a deeper notch in *M. progenes* and *M. gallopavo* than in *M. ocellata*.

2. The interior carpal fossa does not consistently differ in depth in any form, but the posterior carpal fossa is usually shallower in *M. ocellata* than in other forms, contradicting Brodkorb (1964b), who found both carpal fossae to be shallower in *M. progenes* and *M. ocellata* than in *M. gallopavo*.

3. The intermetacarpal tubercle, which may be fused or unfused to metacarpal III in all forms, as noted by Howard (1927), does not consistently differ in position. Brodkorb (1964b) found it positioned more distally in *M. gallopavo* than in *M. progenes*, which is true for all but one individual of *M. gallopavo* which I examined.

4. The facet for digit III does not consistently differ in relative length, contradicting Brodkorb (1964b), who reported a longer facet in *M. progenes* than in living turkeys.

The carpometacarpus of *M. progenes* is very similar to those of Inglis and Coleman specimens. Brodkorb (1964b) found *M. progenes* to be more similar to *M. ocellata* than to *M. gallopavo* in most characters of the carpometacarpus. However, my qualitative data do not reveal a closer resemblance of *M. progenes* to either of the living species. *M. ocellata* has the most distinctive carpometacarpus. Howard (1927) found no basis for relationships in this element.

PELVIS AND SYNSACRUM

1. The median dorsal ridge is usually relatively wider in *M. ocellata* than in *M. gallopavo*. All fossils examined are damaged in this area.

2. The anterior portion of the ilium usually flares more laterad in *M. gallopavo* than in *M. ocellata*. All fossils examined are damaged in this area.

3. The antitrochanter usually has a more decurved ventral border in Inglis and Coleman specimens and *M. gallopavo* than in *M. californica* or *M. ocellata*.

4. The area between the antitrochanter and the obturator foramen is usually more pneumatic in Inglis specimens than in other forms.

5. The ischium is usually more inflected caudally, appearing larger in caudal view, in *M. gallopavo* than in *M. ocellata*. All fossils examined are damaged in this area.

No absolute distinction is ever seen between *M. gallopavo* and *M. ocellata*, all characters being based upon average differences. Little can be said of fossil forms because of their poor condition.

FEMUR

Howard 1927: Pl. 9.

1. The lesser trochanter is notched by the groove for Lig. capsularis femoris to a variable depth in all forms, contradicting Howard (1927), who found it less distinctly grooved in *M. ocellata* than in *M. californica* or *M. gallopavo*. The single specimen of *M. progenes* is similar to individuals of all other forms, contradicting Brodkorb (1964b), who reported a more strongly notched lesser trochanter in *M. californica* and *M. gallopavo* than in *M. progenes* or *M. ocellata*.

2. The groove for Lig. capsularis femoris on the lateral surface of the shaft does not consistently differ in depth in any form, contradicting Brodkorb (1964b), who stated it to be deeper in *M. californica* and *M. gallopavo* than in *M. progenes* or *M. ocellata*.

3. The greater trochanter in medial view usually has a greater proximal extension in *M. gallopavo* than in *M. ocellata*. Inglis and Coleman fossils and *M. californica* may resemble any of the above forms. The specimens of *M. progenes* and *M. crassipes* are damaged in this area.

4. The shaft in medial view is usually less curved in *M. ocellata* than in other forms. The specimen of *M. progenes* is damaged in this area.

5. The posterior intermuscular lines may be fused or unfused in the middle portion of the shaft in all forms except possibly *M. progenes* (in the single known specimen of this species these lines are fused). Howard (1927) noted less convergence of these lines in *M. gallopavo* than in *M. ocellata* or *M. californica*, but Brodkorb (1964b:227) found these lines to be usually "fused along middle third of their length" in *M. ocellata* and *M. californica*, and "usually unfused, although the character is variable" in *M. gallopavo*.

6. The intercondylar groove is usually relatively deeper in *M. crassipes* than in other forms, all of which may resemble each other in depth. This contradicts Howard (1927), who found the intercondylar groove in *M. californica* to be broader but similar in depth to that in *M. gallopavo*, and deeper and narrower in *M. ocellata* than in either *M. californica* or *M. gallopavo*.

7. No other distinguishing characters are seen in the distal end. Howard (1927) noted a greater depth (relative to width) of the inner condyle in *M. californica* than in *M. gallopavo* or *M. ocellata*, and the latter two species were said to have an oblique angle at the junction of the posterior surface of the shaft and inner condyle, as opposed to nearly a right angle in *M. californica*. These characters are not apparent to me.

The three characters (1, 2, and 5) used by Brodkorb (1964b) in stating that *M. progenes* resembled *M. ocellata* more than *M. gallopavo* are found to vary in most species. Yet the femur

of *M. progenes* still resembles that of *M. ocellata* or *M. californica* slightly more than that of *M. gallopavo*. Inglis and Coleman femora show perfect resemblance to each other, and both are also quite similar to that of *M. gallopavo*, *M. ocellata*, and *M. californica*. The femur of *M. ocellata* is least similar to that of *M. gallopavo* or *M. californica*.

TIBIOTARSUS

Howard 1927: Pls. 10, 11.

1. The inner cnemial crest is usually less protrudent laterally in *M. ocellata* than in Coleman specimens or *M. gallopavo*, and Inglis specimens and *M. californica* may resemble any of the above forms. *Meleagris progenes* and *M. crassipes* are damaged in this area. This finding contradicts that of Howard (1927:18), who reported this crest as "Most abruptly thrust toward outside in *Agriocharis* [ocellata]; *Parapavo* [californicus] similar to *Meleagris* [gallopavo] and *Pavo*." She said that her statement on *M. ocellata* agreed with that of L. Miller (1916a), who did not include *M. gallopavo* in his comparison. However, L. Miller did not say whether he was referring to the inner or to the outer cnemial crest. (One must read L. Miller (1916a) with caution because he used "*Agriocharis*" and "*Meleagris ocellatus*" interchangeably. When he spoke of "*Meleagris*," he seemed to be referring either to both *M. ocellata* and *M. gallopavo*, or only to *M. ocellata*.)

2. The internal ligamental prominence is larger in the only undamaged specimen of *M. progenes* than in most Inglis and Coleman specimens and all examples of other forms.

3. No other diagnostic characters are seen in the distal end. L. Miller (1916a) reported the condyles to be closer together and the tunnel under the supratendinal bridge to be larger in *M. ocellata* than in *M. californica*, but these differences are not apparent to me. Based on characters of the tibiotarsus, the affinities of *M. californica* to *M. ocellata* or *M. gallopavo* were unclear to Howard (1927). I agree with Howard and stress the similarity of the tibiotarsi of all turkeys. This statement is not without precedent, as A. Miller and Bowman (1956) and Brodkorb (1964b) have noted the lack of useful taxonomic characters in the distal end of the tibiotarsus in turkeys.

FIBULA

The lateral surface of the fibula in all turkeys is convex to some extent, but it is more convex in *M. californica* than in most Inglis specimens, all Coleman specimens, most *M. gallopavo*, and all *M. ocellata*, partially contradicting Howard (1927), who found it to be convex in *M. californica*, straight in *M. gallopavo*, and slightly convex in *M. ocellata*. Howard also noted variability in the fibula of *M. ocellata*, and regarded the fibula as being of little taxonomic value.

TARSOMETATARSUS

Figs. 10-14; Howard 1927: Pls. 12, 13.

The most diagnostic bone in turkeys is the tarsometatarsus, and many characters of this bone have been used to define various taxa of turkeys. Most important has been the bony spur core on the plantar side of the shaft, which in life is surrounded by a scutellum. Males have a spur, but it is normally absent in females. However, Williams and Austin (1969) estimated that more than 1 percent of the females of *M. gal-*

lopavo osceola in their Florida study area had a spur on at least one leg. Pattee and Beasom (1977) also found at least one tarsal spur on 2 of 228 females of *M. gallopavo intermedia* in Texas.

The normal presence of rudimentary spurs in females of *M. ocellata* has often been cited as a significant difference between that species and *M. gallopavo*, and was used in the original generic diagnosis of *Agriocharis* (Chapman 1896). This rudiment is only a single dark, hardened, and slightly elevated scutellum that is located where the bony spur would be in a male. Its presence is not normally reflected in any way on the tarsometatarsal bone itself. Such a rudimentary spur is also present in females of *M. gallopavo* and is occasionally as developed as in *M. ocellata*.

The scutellum and inner bony spur core of males become increasingly pointed with age. Spur development in *M. gallopavo osceola* may begin at 6 months of age and is not completed by the end of the first year (Lovett Williams pers. comm.). Eaton and Moore (1965-66:39) found the spur core of *M. gallopavo silvestris* to be "only a knob" at age 9-10 months, "more prominent . . . well formed" at age 20-22 months, and "slightly more massive [than at age 20-22 months]" at age 29-33 months. I have noted that males of wild *M. ocellata* have a small (length, 8 to 15 mm), slightly pointed spur by age 8-9 months and develop long, sharply pointed spurs by age 2-3 years. However, the size and pointedness of the spur core seem to show no relationship to the total size of the bone. Eaton and Moore (1965-66:36), in reference to wild *M. gallopavo silvestris*, state, "The hind appendage [=leg], though reaching almost full length at 5-6 months continued to become more massive and developed the bony core for the spur between the tenth and twentieth months." Both the shortest and the longest of ten tarsometatarsi of males of *M. gallopavo osceola* that I measured had short, blunted spur cores. L. Miller (1916a) reported the weakest spur in the longest, and the strongest spur in the shortest, of 25 specimens of *M. californica* he examined.

I also examined the tarsometatarsi of the following species of Galliformes from the collection of Pierce Brodkorb, in addition to those of turkeys, to determine the relationships of *Rhegminornis calobates*: *Odontophorinae*—*Dendrortyx macroura*, *Callipepla squamata*, *Colinus virginianus*; *Phasianinae*—*Alectoris graeca*, *Francolinus sephaena*, *Pternistes swainsonii*, *Coturnix delegorguei*, *Caloperdix ocella*, *Gallus gallus*, *Crossoptilon auritum*, *Catreus wallichii*, *Syrnaticus ellioti*, *Chrysolophus pictus*, *Pavo muticus*; and *Numididae*—*Acryllium vulturinum*.

1. The small calcaneal ridge between the inner and outer calcaneal ridges is not consistently different in size in any form and may be absent in *M. gallopavo*. The specimens of *Rhegminornis calobates* and *M. progenes* are damaged in this area. My findings contradict those of L. Miller (1916a:91), who noted the well marked presence of this medial calcaneal ridge in *M. californica*, but found it to be "almost entirely wanting even in old specimens of *Meleagris gallopavo* . . . but faintly indicated in *M. ocellatus*." Although Wetmore (1924) also used this character, he noted its variability in *M. gallopavo* and commented on its decreased taxonomic significance. Howard (1927) found this ridge to be well developed in *M. ocellata* and *M. californica*, but 18 of her specimens of *M. gallopavo* lacked the ridge, and its development and position in the remaining

13 was variable. A. Miller and Bowman (1956) correctly stated that this ridge is not useful in separating *Meleagris* from *Parapavo*.

2. The large outer calcaneal ridge usually has less plantar protrusion in *M. ocellata* than in other forms, partially contradicting L. Miller (1916a), who reported it to be more prominent in *M. californica* than in *M. gallopavo* or *M. ocellata*. The specimens of *R. calobates* and *M. progenes* are damaged in this area.

3. The larger outer calcaneal ridge usually is relatively longer in *M. crassipes* than in *M. leopoldi*, Inglis and Coleman fossils, *M. gallopavo* or *M. ocellata*. It is either intermediate in length or similar to the shorter specimens of the forms above in *P. kimbballensis* and *M. californica*. The specimens of *R. calobates* and *M. progenes* are damaged in this area. This contradicts L. Miller (1916a), who found it to be shorter in *M. gallopavo* and *M. ocellata* than in *M. californica*.

4. The internal cotyla protrudes more abruptly medially in *M. gallopavo* than in *R. calobates*, *P. kimbballensis*, *M. leopoldi*, several Inglis and Coleman specimens, several *M. californica*, several *M. crassipes*, most *M. ocellata*, and all species of Numidinae, Phasianinae, and Odontophorinae examined. The specimens of *M. progenes* are damaged in this area. Wetmore (1924:9) may have been referring to this same character when he attributed a "proportionally broader and heavier" head of the tarsometatarsus to *M. gallopavo* as compared to *M. californica*.

5. The lateral prominence of the external cotyla is usually slightly less developed in *M. crassipes* than in other turkeys. The specimens of *R. calobates* and *M. progenes* are damaged in this area.

6. Two narrow ridges are present above the tubercle for tibialis anticus in *R. calobates*, *P. kimbballensis*, and all non-meleagridine phasianids examined, but are absent in all known post-Hemphillian turkeys. The specimens of *M. progenes* are damaged in this area.

7. The tubercle for tibialis anticus is narrower but more prominent in *R. calobates* than in other forms, as stated by Olson and Farrand (1974). It is also narrower and more prominent in *R. calobates* than in all other phasianids examined except *Francolinus sephaena* and *Gallus gallus*, in which it is more prominent but equally narrow. The specimens of *M. progenes* are damaged in this area.

8. The acrotarsial groove on the shaft is usually shallower in *M. californica* and *M. crassipes* than in *M. leopoldi*, Inglis and Coleman specimens, or *M. gallopavo*. It is similar in *R. calobates* to shallower individuals of the last three forms listed above, but is shallower than in *M. leopoldi*. It is usually deeper in *P. kimbballensis* and *M. ocellata* than in *R. calobates*, *M. leopoldi*, *M. californica*, or *M. crassipes*. Its depth is also quite variable within other phasianid subfamilies studied. The specimens of *M. progenes* are damaged in this area. This partially contradicts Olson and Farrand (1974), who reported a shallower groove in *R. calobates* than in *M. gallopavo* or *M. ocellata*.

9. The thin ossified intertendinal septum that extends from the hypotarsus nearly to the facet for the hallux is absent in *R. calobates*, but is present in all other turkeys and many other phasianids, as stated by Olson and Farrand (1974). They noted the probable lack of taxonomic significance in this character. The specimens of *M. progenes* are damaged in this area. This septum, absent in young (but full-sized) specimens of fossil and

living turkeys, was found by Eaton and Moore (1965–66) to develop at age 5–6 months in females and 9–10 months in males of *M. gallopavo silvestris*.

10. The spur core is strongly curved upward in *P. kimbballensis*, Inglis specimens, and *M. ocellata*, slightly to strongly curved upward in Coleman specimens, and straight to slightly upcurved in *M. californica*, *M. gallopavo*, and *M. crassipes* (see Fig. 4). The specimens of *M. progenes* and *M. leopoldi* are damaged in this area. No spur core is present on the known specimens of *R. calobates*.

11. The surface of the spur core is of similar roughness in all forms, contradicting Howard (1927:24), who described the spur core of *M. gallopavo* as "roughly built" and that of *M. californica* and *M. ocellata* as "well formed." Developing spur cores have a very rough surface, which becomes smoother with age. Full-length, pointed spur cores are of the same approximate smoothness in all species. Thus the distinction noted by Howard was probably due to age differences in her specimens.

12. The facet for hallux does not consistently differ in position or shape in any turkeys, while in other phasianids it may resemble that of turkeys or be more rounded and deeper. This contradicts Brodkorb (1964b), who reported it as low in *M. progenes*, rather low in *M. ocellata*, and elevated in *M. gallopavo*.

13. The inner intertrochlear foramen is rarely absent only in Inglis and Coleman specimens, *M. californica*, *M. gallopavo*, and *M. ocellata*. It is always present in varying degrees of development in other turkey specimens. Note that the five variable forms are the only turkeys for which a large sample is available. Howard (1927) noted variation in the development of this foramen in *M. californica*, *M. gallopavo*, and *M. ocellata*; A. Miller and Bowman (1956) also noted the inconsistency of this character. Olson and Farrand (1974) noted its presence in *R. calobates* as a meleagridine character to distinguish it from the Phasianidae (*sensu stricto*). However, this foramen may be present in specimens of *Colinus virginianus*, *Alectoris graeca*, *Pternistes swainsonii*, *Coturnix delegorguei*, *Caloperdix ocella*, *Gallus gallus*, *Crossoptilon auritum*, *Chrysolophus pictus*, and *Pavo muticus*.

14. The inner intertrochlear foramen is located lower in one specimen of *R. calobates* (PB 8447) than in all other phasianids examined. Olson and Farrand (1974) stated that it is in the same location in the holotype of *R. calobates* (MCZ 2331) as in *M. gallopavo*.

15. The lateral distal foramen is usually relatively lower in Inglis and Coleman specimens than in other turkeys, including *R. calobates*. Brodkorb (1964b) reported it to be low in *M. progenes* and *M. ocellata*, slightly higher in *M. leopoldi*, and high in *M. gallopavo* and *M. californica*, but these differences are not apparent to me.

16. The lateral distal foramen in plantar view is usually relatively larger in *M. crassipes* and usually smaller in *M. ocellata* than in other turkeys, including *R. calobates*. Olson and Farrand (1974) also reported it to be smaller in *M. ocellata* than in *M. gallopavo*, but reported it to be relatively smaller in *R. calobates* than in *M. gallopavo*. This is not true in specimens that I have examined. They also reported it to be more elongate in meleagridines than in phasianids (*sensu stricto*). However, it may be as relatively large and elongate in *Gallus gallus*, *Crossoptilon auritum*, or *Chrysolophus pictus* as in turkeys.

17. The inner trochlea is usually relatively wider in *M. cras-*

sipes than in other turkeys. The specimens of *R. calobates* are damaged in this area, and that of *P. kimballensis* was not available for study. Brodkorb (1964b) found it to be narrower in *M. progenes* and *M. gallopavo* than in *M. leopoldi* or *M. ocellata*, but I found no consistent difference in this character in these four species.

18. The inner trochlea in plantar view is situated more medially in some *M. ocellata* and all non-meleagridine phasianids examined than in other turkeys, including *R. calobates*. The specimen of *P. kimballensis* was not available for study.

19. The inner trochlea is less elevated in *R. calobates*, *M. leopoldi*, and two specimens of *M. crassipes* than in all other turkeys or all other phasianids examined except *Alectoris graeca*. The specimen of *P. kimballensis* was not available for study, but, in Fig. 1E of Martin and Tate (1970), it appears to be more elevated than in the above forms. Olson and Farrand (1974) reported it to be more elevated in turkeys than in other phasianids (*sensu stricto*), but this is not apparent to me.

20. The inner trochlea is usually situated more on the plantar surface in females of *M. ocellata* than in other turkeys, including *R. calobates*. The specimen of *P. kimballensis* was not available for study. This character is variable among non-meleagridine phasianids examined.

21. The middle trochlea has a similar amount of acrostarsial rotation in certain specimens of each species of turkey, including *R. calobates*, and may resemble certain species of Numididae, Phasianinae, and Odontophorinae. The specimen of *P. kimballensis* was not available for study. This contradicts Olson and Farrand (1974), who found the middle trochlea to be rotated more acrotarsiad in *M. gallopavo* and *R. calobates* than in other Galliformes.

22. The ridge in the proximal portion of the medial plantar border of the middle trochlea is usually less conspicuous in *M. californica* and *M. crassipes* than in other turkeys, including *R. calobates*. Wetmore (1924) also distinguished *M. gallopavo* from *M. californica* on this basis, but noted no variation in this character.

23. The outer trochlea does not vary significantly in its extent of plantar rotation in any turkey. The specimens of *R. calobates* and *P. kimballensis* were not available for study. This contradicts Wetmore (1924), who observed that both lateral trochleae were rotated more plantad in *M. ocellata* than in *M. californica* or *M. gallopavo*.

24. The outer trochlea is usually less elevated in *M. crassipes* than in other turkeys. It is more elevated in *R. calobates* than in other turkeys, as stated by Olson and Farrand (1974), and is also more elevated in *R. calobates* than in all other phasianids examined. The specimens of *P. kimballensis* are damaged in this area.

25. The intertrochlear notches are usually relatively narrower in *M. ocellata* than in *R. calobates* (only inner notch present), *M. progenes*, *M. leopoldi*, Inglis specimens, or *M. crassipes*. Other turkeys may resemble any of the above forms, but are least similar to *M. ocellata*. The specimens of *P. kimballensis* are damaged in this area. The intertrochlear notches of all non-meleagridine phasianids examined are similar to those of certain turkeys. This contradicts Brodkorb (1964b) who reported them to be wider in *M. progenes* than in other turkeys, and also Olson and Farrand (1974), who noted less divergent trochleae in *R. calobates* and *M. ocellata* than in *M. gallopavo*.

Table 3 presents a quantitative compilation of the 18 char-

acters of the tarsometatarsus in which a significant difference is seen between at least two forms listed above. *Rhegminornis calobates* shows the lowest overall similarity to other forms, and possesses two typically phasianine characters (characters 6, 7). It is more similar to that of *Proagriocharis kimballensis* or *M. leopoldi* than to all other forms, to which it is consistently the most dissimilar species. The tarsometatarsus of *P. kimballensis* is more similar to that of later forms than is the tarsometatarsus of *R. calobates*, although retaining phasianine character 6. It is least similar to those of *M. crassipes*, and its modest degree of resemblance to all other forms is greatest with *M. progenes* and *M. leopoldi*. *Meleagris progenes* is very similar to *M. leopoldi*, Inglis and Coleman specimens, *M. gallopavo*, and *M. californica*. *Meleagris leopoldi* is very similar only to *M. progenes*, but it is quite different from only *R. calobates* and *M. crassipes*. Inglis specimens are very similar to those of *M. progenes* and the Coleman specimens, and the latter are also very similar to *M. progenes* and *M. gallopavo*. *M. gallopavo* has a high degree of resemblance to *M. progenes*, Coleman specimens, and *M. californica*, with the last also closely resembling *M. progenes*.

High levels of similarity of the magnitude noted between the tarsometatarsi of *M. progenes*, *M. leopoldi*, Inglis and Coleman specimens, *M. gallopavo*, and *M. californica* are not noted in *M. ocellata* or *M. crassipes*. These two species are very unlike each other and display only a modest degree of similarity to all forms but *R. calobates*, with the exception that *M. crassipes* is fairly similar to *M. californica* and quite dissimilar to *P. kimballensis*.

Ratios of all of the measurements of every element of the various taxa were computed and compared. These data, available from the author on request, prove to be of limited taxonomic value with the exception of the data on the tarsometatarsi of males. To my surprise, the greatest difference among all of the taxa in these proportions is often between Recent specimens of *M. gallopavo silvestris* and *M. g. osceola*. Thus, considering this high variability within a living species, I regard the use of intra-elemental proportions in the definition of extinct genera and species as being generally of very limited value, except as discussed below.

The angle of the spur core (Table 20: K) and the relative height of the spur core (Table 22: F/A, G/A) have traditionally been very important in the definition of various taxa of turkeys. It may be seen from my data that the angle of the spur core is smallest in *P. kimballensis* and *M. crassipes*, although both species are represented by only one individual. Next appears the intermediate group of *M. progenes*, *M. leopoldi*, Inglis and Coleman specimens, and *M. californica*. A gradation is seen in the various large samples from Florida, with a steadily increasing angle through time from Inglis to Coleman to Ichetucknee to modern *M. g. osceola*. Note the large amount of overlap between adjacent samples through this progression. Also note the high degree of variability in this angle within any given large sample. These data suggest the use of great caution when making taxonomic conclusions based upon only minor differences.

L. Miller (1940) reported angles of 39 and 79 degrees, respectively, for *M. crassipes* and *M. californica*, while A. Miller and Bowman (1956) reported angles of 53.0 to 58.5 degrees for *M. leopoldi*, 62.0 degrees in *M. californica*, and 63.5 to 71.5 degrees in *M. gallopavo*. Brodkorb (1964b) reported angles of 60 to 80 degrees in *M. gallopavo* and *M. californica*, while

Martin and Tate (1970) reported angles of less than 60 degrees in *P. kimballensis* (39 degrees) and "*Agriocharis*," and angles greater than 60 degrees in *M. californica* or *M. gallopavo*. Brodkorb (1964b) appears to have placed too much weight on this angle when he said, "Both *A. leopoldi* (A.H. Miller and Bowman 1956) and *A. crassipes* (L. Miller 1940) have the spur core low on the shaft and at an angle of less than 60 degrees, characters that require their removal from the genus *Meleagris*, in which they were described." However, both *M. gallopavo* and *M. californica* may commonly have a spur core angle of under 60 degrees (Table 20). Also, *M. crassipes* has a greater average relative height of the spur core than all other species (Table 22: F/A, G/A), with *M. californica* and *M. gallopavo* intermediate between it and the forms with lower spur cores (*M. leopoldi*, Inglis and Coleman specimens). Thus, the height of the spur core, which is very different in *M. crassipes* than in *M. leopoldi*, cannot be used as a generic character to separate both *M. crassipes* and *M. leopoldi* from *M. gallopavo*. *Proagriocharis kimballensis* and *M. progenes* have spur core heights that resemble those of many other species, and large samples of these species are needed before anything definitive can be stated. Note the high variability of this character in Coleman specimens, *M. gallopavo*, and *M. californica*, demonstrating the variation that may occur in large samples. L. Miller (1916a) first used spur core height as a taxonomic character, reporting a height of 40 to 41 percent in *M. californica*. Howard (1927) reported a height of 39.2 to 46.9 percent in *M. gallopavo*, 41.3 to 49.7 percent in *M. californica*, and 40.0 percent in *M. ocellata*, her figures corresponding to F/A of Table 22; the figures of more recent authors pertain to G/A. Noting no variation, L. Miller (1940) reported heights of 45 percent in *M. crassipes*, 43 percent in *M. gallopavo*, 42 percent in *M. californica*, and 35 percent in *M. ocellata*. The height (39.8 percent) in *M. leopoldi* reported by A.H. Miller and Bowman (1956) is a composite based on measurements from two different specimens; the 36.3 percent reported herein is based solely upon the paratype tarsometatarsus. Other values of A. Miller and Bowman (1956) are 41.7 to 46.0 percent in *M. californica*, 41.2 to 43.4 percent in *M. gallopavo*, and 36.0 percent in *M. ocellata*. The relative spur core height in *M. progenes*, described as "situated low" in the Rexroad specimen by Brodkorb (1964b:225), can be computed only from the tentatively referred specimen from Benson, Arizona. The absolute height of the spur core (Table 20: F, G) of the Rexroad specimen of *M. progenes* is about at the minimum range of Inglis specimens. Martin and Tate (1970) listed a height of 36 percent in *M. ocellata* and 42 percent in *P. kimballensis*, saying that the latter just overlaps the lower range of *M. gallopavo* and *M. californica*. However, the figure of 42 percent is erroneous, for assuming that their figures for total length (98 mm) and spur core height (40 mm) are correct, the relative spur core height would be 40.8 percent. The relative stoutness of the spur core (Table 22: H/J) is greatest in *M. crassipes*, and averages smallest in *M. ocellata*.

DISCUSSION OF FOSSIL TURKEYS BY LOCALITY

MIocene (HEMINGFORDIAN)

THOMAS FARM, Gilchrist County, Florida, *Rhegminornis calobates*. Tarsometatarsus (MCZ 2331, PB 8447-8449)—Ta-

ble 21, Fig. 14; Figs. 1-2 of Olson and Farrand (1974), in which PB 8448 is mislabelled PB 1776. This species, originally described by Wetmore (1943) in the Jacanidae (Charadriiformes), was removed from the Jacanidae and placed in the Meleagridinae by Olson and Farrand (1974). While agreeing that it is a member of the Phasianidae (*sensu lato*), I feel that the known specimens of *R. calobates* are insufficient to place it unequivocally in the Meleagridinae, although such a placement may very well be correct. The four meleagridine characters of *R. calobates* used by Olson and Farrand to exclude it from the Phasianidae (*sensu stricto*) may be found in certain species of Phasianidae (see characters 13, 16, 19, 21). Using living species to define the characters of meleagridine versus non-meleagridine phasianids, *R. calobates* has characters of both groups, suggesting that a redefinition of these subfamilies would be necessary if one were going to include *R. calobates* in one of them. Such a redefinition would be of limited value at present because of our fragmentary knowledge of *R. calobates*. Also, it would tend to mask the intermediate nature of the specimens, and, as more specimens of *R. calobates* and other Tertiary phasianids become available, such redefinitions would become increasingly difficult and meaningless. I have not attempted to place *R. calobates* in a modern subfamily because of the apparently mosaic nature of its tarsometatarsus and its lack of other known elements.

An indication of the degree of similarity between *R. calobates* and various turkeys can be seen in Table 3. It is most similar to *Proagriocharis kimballensis* and *Meleagris leopoldi*, although every form except *P. kimballensis* is less similar to *R. calobates* than any other form. This, as well as overall size, suggests that *R. calobates* could be an early form of turkey, possibly near the ancestry of *P. kimballensis*. However, this hypothesis is very tentative at present as it is based on but one element. It must be kept in mind that the amounts of similarity seen in any of the relatively poorly known forms in Tables 2 and 3 may be an artifact of small sample sizes.

EARLY LATE MIOCENE (CLARENDONIAN?)

WESTMORELAND STATE PARK, Westmoreland County, Virginia. Claremont Member of Eastover Formation (Blackwelder and Ward, unpubl.; *vide* Lauck Ward). Meleagridinae, cf. *Meleagris*. Tibiotarsus (USNM 237260)—Table 19. This specimen is a left tibiotarsus with only a very small section of the shaft missing. It is slightly eroded and possibly from a juvenile and could not be distinguished qualitatively from tibiotarsi of *M. gallopavo* or *M. ocellata*. However, as the tibiotarsus of turkeys is nearly lacking in diagnostic characters (see page 137), positive assignment to *Meleagris* is not justified. Most importantly, however, this specimen documents the occurrence of a fairly large turkey as early as the late Miocene. Lacking comparable elements, nothing can be said of the affinities of this specimen to *Rhegminornis calobates* or *Proagriocharis kimballensis*, both of which are much smaller.

I carefully compared this specimen with all other Tertiary specimens of turkeys, as well as with skeletons of several genera of the Cracidae, as this family of Galliformes is known to occur in Tertiary fossil localities in North America (Brodkorb 1964a). All specimens reported herein have phasianid characters and can be distinguished from specimens of the Cracidae.

LATE MIOCENE OR EARLY PLIOCENE (HEMPHILLIAN)

UNSM COLL. LOC. FT-40, Frontier County, Nebraska. *Proagriocharis kimballensis*. Coracoid (UNSM 20033)—Table 4. Tarsometatarsus (UNSM 20035–20037)—Tables 20–22, Fig. 14; Fig. 1 (reduced by the printer beyond the authors' wishes) of Martin and Tate (1970). Described as a new genus and species by Martin and Tate (1970), I tentatively regard *P. kimballensis* as distinct from *Meleagris*, cautiously noting that this conclusion is based upon only two elements of the skeleton. Fortunately, both spurred and unspurred tarsometatarsi exist of *P. kimballensis*, thus indicating the relative size of the supposed males and females. *Proagriocharis kimballensis* is smaller than any other turkey except *R. calobates*.

Proagriocharis kimballensis is most similar to *R. calobates*, *M. leopoldi*, and the Inglis fossils (Table 2). However, only the tarsometatarsi of *M. leopoldi* and *R. calobates* could be compared with *P. kimballensis*. In Table 3, *P. kimballensis* is seen to be most similar to *M. progenes* and *M. leopoldi*, although several other taxa are nearly as similar. In reporting a greater overall similarity of *Proagriocharis* to *Agriocharis* than to *Meleagris* (*gallopavo*) or *Parapavo* (*californicus*), Martin and Tate (1970) followed Brodkorb (1964a, b) in regarding *Agriocharis* as including the species *progenes*, *leopoldi*, *anza*, *crassipes*, and *ocellata*, of which *progenes* and *crassipes* are seen herein to be qualitatively the least similar of all turkeys to *Proagriocharis* (Table 2). *Meleagris progenes* and *M. crassipes* are, however, the most similar of the above to *P. kimballensis* in size. The H/A ratio of *P. kimballensis* is greater than that of all others (Table 22), but approaches that of *M. crassipes*.

In their generic diagnosis of the tarsometatarsus, Martin and Tate (1970) found *Proagriocharis* to differ from *Meleagris* (*gallopavo*) and *Parapavo* (*californicus*), but to resemble *Agriocharis* (*progenes*, *leopoldi*, *crassipes*, and *ocellata*), in having an angle of the spur core of less than 60 degrees. An increased sample size (Table 20: K) indicates that the spur core angle is not a generic character (see discussion on pages 139–40).

According to Martin and Tate (1970:215), "The spur core (cast) is more proximally placed (42 percent of the total length) than it is in *Agriocharis ocellata* (36 percent of the total length), and just overlaps the lower range of *Parapavo* [*californicus*] and *Meleagris* [*gallopavo*] in this respect." The relative height of the spur core of *P. kimballensis*, if based on their reported measurements (p. 217), would be 40.8 percent, as mentioned above, not 42 percent as reported. However, as Martin and Tate state, these measurements are from a cast and are therefore probably not extremely accurate. The figure of 40.8 percent is within the range found for numerous other forms (Table 22: G/A), and it is no basis for separating the species from other species at the generic level.

Martin and Tate (1970:217) distinguish *M. progenes* and *M. leopoldi* from *P. kimballensis* "because of the difference in the placement of the spur core in this species." I agree with them in the difference of the angle of spur core (Table 20: K), but find that the difference they report in the relative height of the spur core requires some clarification. It has been established above that the true height of the spur core of the single specimen of *P. kimballensis* is 40.8 percent, not 42 percent. They report the spur core of *M. leopoldi* (1970:217) to be "placed

slightly lower (39.8 percent of the total length) than it is in *P. kimballensis* (see Miller and Bowman 1956:44)." They do not mention the fact that Miller and Bowman's ratio was based on the total length of the paratype and the height of the spur core of the holotype. Had Martin and Tate examined the paratype tarsometatarsus of *M. leopoldi*, a greater difference between it and *P. kimballensis* would have been seen (Table 22: G/A). Martin and Tate (1970:217) continue that the spur core of *M. progenes* is "slightly more distally placed than in *A. leopoldi*." This is true (Table 20: G), but it must be stressed that the relative height of the spur core in *M. progenes* from Rexroad, Kansas, is unknown, although it is 42.8 percent in a specimen of *Meleagris* cf. *M. progenes* from Benson, Arizona.

In summary, *Proagriocharis* is retained herein as a distinct genus, mainly because of its low similarity to most other forms as seen in Tables 2 and 3, although many characters used by Martin and Tate (1970) to distinguish it from other turkeys are shown to be invalid. As stated in the discussion of *Rhegmimornis* above, *Proagriocharis* is probably not on or near the lineage leading to the larger Pleistocene and Recent forms of *Meleagris*. However, many more specimens of varying ages are needed before the relationships of *Proagriocharis* to earlier or later forms can be clearly stated.

BUCKHORN, Grant County, New Mexico. Meleagridinae, cf. *Meleagris*. Tibiotarsus (F:AM 10434)—Table 18. This specimen is from a form much larger than indicated for the known species of *Rhegmimornis* and *Proagriocharis*. It is not qualitatively distinguishable from *Meleagris*, and it also resembles several species of *Meleagris* in size.

CLIFTON COUNTRY CLUB, Graham County, Arizona. Meleagridinae, genus and species indeterminate. Coracoid (F:AM 10421)—Table 4. This specimen, a humeral end of a coracoid, is similar in size to that of *Proagriocharis kimballensis*, if it represents a male. If it represents a female, it is similar in size to those of *M. californica*, *M. ocellata*, and *M. crassipes*. It resembles that of *P. kimballensis* in characters 7 and 10, but resembles the coracoids of all turkeys in characters 9, 13, 14 and 15. It differs from that of *P. kimballensis* in character 11, and is intermediate between that of *P. kimballensis* and other forms in character 17. Although agreeing with *M. crassipes* in all of its characters, this specimen cannot justifiably be referred to a known species.

BONE VALLEY (PALMETTO MINE), Polk County, Florida. Meleagridinae, cf. *Meleagris*. Distal end of tibiotarsus (UF 21033)—Table 19. No characters apparent other than size. This is the earliest definite record of a turkey in Florida, pending further elucidation of the affinities of *Rhegmimornis*. This tibiotarsus and those from Westmoreland Park, Virginia, and Buckhorn, New Mexico, suggest a rather widespread occurrence of fairly large turkeys in the late Miocene and early Pliocene.

PLIOCENE (HEMPHILLIAN OR BLANCAN)

UNIVERSITY DRIVE, Orange County, California. *Meleagris* sp. Femur (LACM 64001)—Table 16. No characters apparent other than size. The primary significance of this specimen is that it documents the earliest known occurrence of a turkey in southern California.

LATE PLIOCENE (BLANCAN)

HAILE XVA, Alachua County, Florida. *Meleagris* sp. Tibiotarsus (UF 17545)—Table 18. No characters apparent other than size. Reported as *M. gallopavo* by Campbell (1976).

BENSON, Cochise County, Arizona. *Meleagris* cf. *M. progenes*. Tarsometatarsus (AMNH 6330, USNM 10551)—Tables 20, 22, Fig. 10; Fig. 5 of Wetmore (1924). USNM 10551 was referred to the genus *Agriocharis* by Wetmore (1924), while Brodkorb (1964b) referred this specimen to *A. progenes* because it was "similar in size and position of the spur core" (1964b:225). I have also examined a nearly complete tarsometatarsus from this site in which the spur core is broken. These specimens agree closely in size only with *M. progenes* from Rexroad, Kansas, and with *M. crassipes*. I refer them only tentatively to *M. progenes* because they are qualitatively separable only from *Rhegminornis calobates* (characters 14, 19) and *M. crassipes* (characters 5, 8, 16).

CITA CANYON, Randall County, Texas. *Meleagris leopoldi*. Tibiotarsus (PPHM 3174). Tarsometatarsus (PPHM 3169)—Tables 20, 22, Fig. 10; Fig. 1 of A. Miller and Bowman (1956). Reported as *Parapavo californicus* by L. Miller and Johnston (1937) and as cf. *Meleagris* by Johnston and Savage (1955), these specimens were described as a new species, *Meleagris leopoldi*, by A. Miller and Bowman (1956). Brodkorb (1964b) transferred *M. leopoldi* to *Agriocharis* on the basis of characters that are not considered herein to be of generic value, as detailed on pages 139–40 of the Comparative Osteology section.

Unfortunately, the tarsometatarsus is the only diagnostic element of *M. leopoldi* known from Cita Canyon. *Meleagris leopoldi* resembles rather closely all forms except *Rhegminornis*, *M. ocellata*, and *M. crassipes*, being closest to *M. progenes* (Table 3). The tarsometatarsus of *M. leopoldi* is consistently larger than that of *M. progenes*, although some degree of overlap would probably be seen if larger samples of each form were available. Potentially significant differences between *M. leopoldi* and *M. progenes* (specimens from both Rexroad and Benson considered) are seen in the B/E, E/A, and G/A ratios (Table 22). *Meleagris leopoldi* resembles specimens from Inglis in every measurement (Table 20) except A and E, the first of which can be extremely variable (note, for example, the range of all Recent specimens of *M. gallopavo* in Table 20). *Meleagris leopoldi* differs from *M. californica* in measurements E, F, and G (Table 20) and in the F/A and G/A ratios. *Meleagris leopoldi* is consistently smaller than *M. gallopavo* and differs in its G/A ratio. *Meleagris leopoldi* resembles *M. ocellata* in all measurements except D, and all ratios of these two forms are similar. *Meleagris leopoldi* is larger and of different proportions than *M. crassipes*.

It is seen from the comparisons above that the Cita Canyon specimen closely resembles both qualitatively and quantitatively only the Inglis specimens, although its high degree of qualitative similarity with *M. progenes* also suggests close affinities to that form. Considering the amount of variation seen in *M. gallopavo* in Table 20, it is quite likely that, if large samples of turkeys were available from Benson, Cita Canyon, and Rexroad, a case could be made for their conspecificity.

REXROAD, Meade County, Kansas. *Meleagris progenes*. All specimens have UMMP numbers. Premaxilla (31052). Man-

dible (47783). Sternum (31039). Coracoid (20940)—Table 4. Scapula (45930, 45965)—Table 7, Figure 9. Ulnare (48109). Carpometacarpus (20941, 48188)—Tables 14, 15. Femur (45912)—Table 16. Tibiotarsus (45970, 48191)—Table 19. Tarsometatarsus (31034, 48189)—Tables 20, 21, Figures 10, 14; Pl. I of Brodkorb (1964b). This species was described as *Agriocharis progenes* by Brodkorb (1964b) because of its supposed greater similarity to *M. (Agriocharis) ocellata* than to *M. gallopavo*. However, *M. progenes* shows no greater affinity to one of the living species than to another (Table 2). Nevertheless it is more similar to them than to either *Rhegminornis* or *Proagriocharis*, which supports its inclusion in the genus *Meleagris*. The apparent similarity between *M. progenes* and *M. leopoldi* seen in Table 3 is based only on the tarsometatarsus and thus may not be an accurate reflection of affinities (compare Table 2 to Table 3). *M. progenes* is of a size that may be distinct from all other forms except *M. crassipes*, to which it does not show enough qualitative resemblance to suggest a close relationship.

EARLY PLEISTOCENE (IRVINGTONIAN)

GILLILAND, Knox County, Texas. *Meleagridinae*, genus and species indeterminate. Coracoid (PB unnumbered)—Table 5. Femur (UMMP 39387)—Table 17; Pl. I of Brodkorb (1964b). No characters other than size are apparent in the badly crushed coracoid from the Bruce Burnett Ranch. The femur from Rattlesnake Point, reported as *Agriocharis* sp. in Hibbard (1960), was referred to *M. (Agriocharis) anza* by Brodkorb (1964b:228) on the basis of "agreement in geologic horizon, general size, and marked expansion of the shaft of the femur (shaft of humerus expanded in type of *A. anza*).” I have not examined this specimen, but do not consider it safely referable to *M. anza* for the following reasons: (1) chronological agreement is not a sound basis for biological relationship; (2) agreement in size is not guaranteed because of the uncertainty of the sex of the specimens involved; (3) a mediolateral expansion of the shaft of the femur is not known to be related to such an expansion in the humerus (in the case of the Vallecito Creek specimen, the expansion is due to crushing); (4) as noted by Brodkorb (1964b), no femur is known from Vallecito Creek, making direct comparison of specimens impossible. As neither the coracoid nor the femur from Gilliland are large enough to be safely referable to *Meleagris*, no generic allocation is made.

INGLIS IA, Citrus County, Florida. *Meleagris* cf. *M. leopoldi* or *M. anza*. All specimens have UF numbers. Numbers in parentheses are numbers of specimens examined. Individual catalogue numbers available on request. Cranium (9). Premaxilla (1). Quadrate (8). Mandible (7). Basihyal (1). Axis (5). Cervical Vertebra (128). Sixth Thoracic Vertebra (12). Fused Thoracic Vertebrae (24). Synsacrum (41). Caudal Vertebra (6). Pygostyle (3). Vertebral Rib (32). Sternal Rib (14). Sternum (26). Furcula (5)—Figure 8. Coracoid (67)—Tables 4, 5. Scapula (34)—Tables 8, 9, Fig. 9. Humerus (94)—Tables 12, 13. Ulna (73)—Tables 10, 11. Radius (46)—Tables 12, 13. Ulnare (10). Radiale (8). Carpometacarpus (49)—Tables 14, 15. Pollex (11). Manus Digit II, Phalanx I (24). Manus Digit II, Phalanx II (10). Manus Digit III (4). Pelvis (31). Femur (81)—Tables 16, 17. Patella (1). Tibiotarsus (93)—Tables 18, 19. Fibula (28). Tarsometatarsus (108)—Tables 20–22, Figs. 10, 12, 14. Hallux (6). Pes Digit I, Phalanx I (6). Pes Digit II, Phalanx I

(13). Pes Digit II, Phalanx II (13). Pes Digit III, Phalanx I (24). Pes Digit III, Phalanx II (13). Pes Digit III, Phalanx III (11). Pes Digit IV, Phalanx I (13). Pes Digit IV, Phalanges II, III, IV (28). Ungual Phalanx (16). Misc. Pedal Phalanx (3). Known from about 1240 specimens, this is the earliest turkey for which any appreciation of individual variation can be attained. Previously (Steadman 1975), and with much hesitation, I referred the Inglis fossils to *M. anza* because the humeri could not be distinguished from the poorly preserved holotype of *M. anza*. However, as already noted, the tarsometatarsus of *M. leopoldi* also bears much resemblance to those from Inglis, and the two populations may represent a single species. Again I am faced with the problem of referring a large series of specimens to a species known essentially from one element. *Meleagris leopoldi* is based on a tarsometatarsus (unknown in *M. anza*), a very diagnostic and commonly preserved element of turkeys. As the tarsometatarsus is spurred, we can be reasonably sure that the known specimens of *M. leopoldi* represent males, thereby also providing an idea of the size of the females. That a strong sexual dimorphism in size was developed even before the time of *M. leopoldi* is shown by the carpometacarpus and tarsometatarsus of *M. progenes*. Although the holotype humerus of *M. anza* equals those of females from Inglis in size, the possibility exists that it actually represents a male of a very small species. Referral of the Inglis specimens to either *M. leopoldi* or *M. anza* is somewhat tentative, each species being based on specimens of only one skeletal element. However, I consider this action to be better than describing the turkey from Inglis as a new species, thereby adding another name of dubious validity to the already excessively long list of specific names of turkeys. I believe that future discoveries of turkeys of ages similar to those of Cita Canyon, Inglis, and Vallecito Creek may show that the turkeys from these sites represent one lineage that slowly increased in size through time. In this case, the delimitation of species would be arbitrary, and *M. leopoldi* and *M. anza* might even be regarded as conspecific. That a single species of turkey could have such a wide geographical range is not at all surprising when one considers the present range of *M. gallopavo* and the diverse types of habitat that it occupies. If new fossils prove that the turkeys from Inglis are distinct from those of Cita Canyon or Vallecito Creek, appropriate nomenclatural steps can be taken at that time.

Closest affinities of the turkey from Inglis appear to be with fossils from Coleman; and it is least similar to *Rhegminornis calobates*, *Meleagris gallopavo*, and *M. ocellata* (Table 2). As shown in Table 3, the greatest resemblance is with *M. progenes* and fossils from Coleman, with only *R. calobates* being very dissimilar. The Inglis turkey is larger in size than *R. calobates*, *P. kimballensis*, *M. progenes*, *M. ocellata*, and *M. crassipes*; equal to or slightly larger than *M. leopoldi* or *M. californica*; slightly smaller than the population from Coleman; smaller than *M. gallopavo*.

Distinctive ratios of the Inglis fossils in Table 22 include the following: G/A is less than in all other forms except *M. leopoldi*; J/A is greater than in all forms except Coleman specimens and *M. ocellata*; K/A is less than in all forms except *M. crassipes*; P/A is less than in all forms except *M. g. osceola*.

Were it not for the series of intermediate fossils from Coleman, the degree of difference between the Inglis fossils and *M. gallopavo* apparent from Table 2 would suggest a possible sudden replacement of the early *leopoldi-anza*-like form by the

larger *gallopavo* at some point in the Pleistocene. It now appears that the Florida peninsula, if not much of the southern portion of North America, has been occupied since at least Blancan times by a series of populations of turkeys that increased slightly in size through time.

The turkey from Inglis possesses certain features, such as the stout furcula and the non-pneumatic scapula, that are thus far unknown in any later forms. The evolutionary implications of these structures will be discussed in the section on evolution.

VALLECITO CREEK, San Diego County, California. *Meleagris anza*. All are LACM 3753. Sternum. Humerus—Table 9; Pl. III in Howard (1963). Ulna. Synsacrum. This material was described as a new species, *Agriocharis anza*, by Howard (1963), with a humerus as the holotype. Unfortunately, specimens other than the humerus are damaged beyond usefulness. The holotype humerus is crushed more severely on the anconal side than on the palmar side. I consider its broad, flat shaft (Table 9: C, D) and deep brachial depression (character 9) to be due to this crushing, a possibility recognized by Howard (1963). I also regard the curvature of the shaft (character 8) as an artificial condition. Therefore, characters 8 and 9 are not considered in compiling Table 2, in which the humerus from Vallecito Creek is seen to be slightly closer to Inglis specimens and those of *M. gallopavo* than to those of other forms. Based upon only seven characters of just one element, these figures may be of little value. The holotype of *M. anza* differs from other forms in the following qualitative characters: Coleman specimens—character 12; *M. gallopavo*—character 12; *M. californica*—characters 10, 12; *M. ocellata*—characters 5, 7, 12; *M. crassipes*—characters 7, 12. It cannot be distinguished from humeri from Inglis by any of these characters. In referring this humerus to *Agriocharis* instead of *Meleagris*, Howard's (1963) characters included the shape of the external condyle (character 13), now known to be variable and therefore of little value, and the orientation of the attachment of *M. pronator brevis* (character 10), which varies in some forms, but appears to be consistent in others. This single specimen cannot provide any indication of individual variation of its population.

Except for the width and depth of the shaft, which are altered by crushing, this specimen resembles in size the females of several different forms. If the material from Vallecito Creek had not already been the basis for the description of a new taxon, I would have called the material "Meleagridinae, cf. *Meleagris*." As this material cannot be clearly distinguished quantitatively from several species of *Meleagris*, its tentative referral to *Meleagris* would seem justified. However, as the available specimens from Vallecito Creek represent the type material of *Meleagris anza*, instead of regarding this name as a *nomen dubium*, I retain it with the hope that more diagnostic specimens will be recovered at this site in the future. An effective suite of characters simply cannot be based on poorly preserved material of only one or several elements, especially when dealing with such intraspecifically variable organisms as turkeys. Diagnoses based on single specimens of variable organisms cannot account for individual variation and will almost surely be altered by the discovery of new specimens. The old idea that avian fossils are very rare has promoted descriptions of "species" based on material that is often at best indicative only of a family or genus, thereby forcing future workers

either to tentatively refer similar new fossil material to the poorly defined taxon, or else not recognize the old taxon. Only through the discovery of new, more diagnostic fossils at Vallecito Creek can the true affinities of *M. anza* be learned.

PORT KENNEDY CAVE, Montgomery County, Pennsylvania. *Meleagridinae* cf. *Meleagris*. Carpometacarpus (ANSP 165)—Table 14. Without naming the element(s) involved, Wheatley reported "a turkey" (1871a:237) and "*Meleagris* —?" (1871b:385) from this site. Mercer (1899:280) included "*Meleagris altus*, leg bone with spur" in his faunal list of Port Kennedy Cave, noting that the single specimen was excavated by Wheatley in 1871. The location of this specimen is unknown to me. Wetmore (1931b) listed this record as *M. superba* (= *alta*) as did Brodkorb (1964a), under the name *M. alta*. The only fossil of a turkey from this site that I have examined is a previously unreported complete carpometacarpus, which differs from those of Inglis, Coleman, and *M. gallopavo* in having metacarpal I less protrudent anteriorly, although several specimens from Inglis closely approach its condition. It is larger than females of any species, and, if it represents a male, it is the size of those of Inglis, Coleman, or *M. californica*, being slightly smaller than in *M. gallopavo*.

The exact affinities of this specimen cannot be determined from the available data. Although resembling *Meleagris* in size, it differs from this genus in its small metacarpal I. Generic characters of the carpometacarpus of turkeys are at present undetermined, as this element is unknown in *Rhegminornis* or *Proagriocharis*.

HAILE XVI A, Alachua County, Florida. *Meleagris* sp. Scapula (UF 22083, 22084)—Table 7. Humerus (UF 22081, 22082)—Table 8. Femur (UF 22086). Tibiotarsus (UF 22085). Pedal Phalanx (UF 22087). The scapulae have a pneumatic foramen, thus resembling post-Inglis forms. They agree in size with the Coleman fossils more than with the Inglis form or *M. g. osceola*. The distal end of a humerus shows no characters other than size, in which it resembles Inglis specimens more than the Coleman fossils or *M. gallopavo*.

These fossils are referred to *Meleagris*, but not to any species, on the basis of the above characters. These specimens suggest a form of turkey between those of Inglis and Coleman if one assumes that the same lineage is involved. A refinement of the age of this site is expected once the mammalian fauna is studied further. This will help to pinpoint the time of the development of the pneumatic foramen in the scapula.

WILLISTON, Levy County, Florida. *Meleagris* sp. Femur (PB 2321). No characters apparent other than size. Reported as *M. gallopavo* by Holman (1959:5) and Brodkorb (1964a:335).

COLEMAN IIA, Sumter County, Florida. *Meleagris* sp. (intermediate between *leopoldi-anza* and *gallopavo*). All specimens have UF numbers. Numbers in parentheses are numbers of specimens examined of each element. Individual catalogue numbers available on request. Cranium (3). Premaxilla (1). Axis (2). Cervical Vertebra (53). Sixth Thoracic Vertebra (4). Fused Thoracic Vertebra (1). Synsacrum (7). Sternal Rib (2). Sternum (12). Coracoid (18)—Tables 4, 5. Scapula (6)—Tables 6, 7, Fig. 9. Humerus (37)—Tables 8, 9. Ulna (23)—Tables 10, 11. Radius (9)—Tables 12, 13. Radiale (1). Carpometacarpus (12)—Tables 14, 15. Manus Digit II, Phalanx I (2). Manus Digit II, Phalanx II (2). Pelvis (7). Femur (27)—Tables

16, 17. Tibiotarsus (33)—Tables 18, 19. Tarsometatarsus (35)—Tables 20–22, Figs. 10, 12, 14. Pes Digit II, Phalanx I (4). Pes Digit III, Phalanx I (8). Pes Digit III, Phalanx II (2). Pes Digit III, Phalanx III (1). Pes Digit IV, Phalanx I (1). These 320 fossils provide a link between the older *M. leopoldi-anza*-like forms and the younger *M. gallopavo* and *M. californica*. I noted previously (Steadman 1975) an intermediateness between the Inglis fossils and later forms and referred the Coleman fossils to *M. anza*, thereby attempting to stress their similarity to the Inglis fossils. Although showing a slightly greater overall resemblance to the Inglis specimens than to those of *M. gallopavo* or *M. californica*, the Coleman fossils are not herein regarded as conspecific with those from Inglis since a distinct change, the attainment of a pneumatic foramen in the scapula, occurred in the interval between deposition of the Inglis and Coleman faunas. In the absence of the Coleman specimens, the relatively low amount of similarity of the specimens from Inglis to *M. gallopavo* (Table 2) would suggest a more distant relationship than is proposed herein. The Coleman turkey shows less similarity to *M. ocellata* or *M. crassipes* than to *M. progenes*, *M. gallopavo*, or *M. californica* (Table 2). Its lowest similarity is with *Rhegminornis calobates* and *Proagriocharis kimballensis*.

The Coleman specimens are definitely larger in overall size than those of *Rhegminornis calobates*, *Proagriocharis kimballensis*, *M. progenes*, or *M. crassipes*; almost always larger than those of *M. ocellata*; usually larger than Inglis specimens or *M. californica*, overlapping more with the former than with the latter; and usually smaller than those of *M. gallopavo*, often with overlap.

Distinctive ratios of the Coleman specimens in Table 22 are as follows: B/E is greater than in Inglis specimens; J/A is greater than in all others except Inglis specimens and *M. ocellata*. A general trend in these ratios is the relative stoutness of the Coleman specimens as compared to *M. g. osceola*. In every case, however, specimens from Rancholabrean sites in Florida either more strongly resemble Coleman specimens than those of *M. g. osceola*, or are intermediate, providing further evidence that the Coleman form was directly ancestral to *M. gallopavo*.

SANTA FE RIVER IIA, Gilchrist County, Florida. *Meleagris* cf. *M. gallopavo*. Ulna (UF 14930)—Table 10. Femur (UF 14928)—Table 16. Tibiotarsus (UF 22078)—Table 18. Tarsometatarsus (UF 22076, 22077)—Tables 20, 22. These specimens resemble specimens of late Rancholabrean and Recent *M. gallopavo* more closely than those of Inglis or Coleman in size and H/C ratio (Table 22). However, the tarsometatarsus differs from that of *M. gallopavo* in character 4.

LATE PLEISTOCENE (RANCHOLABREAN)

RANCHO LA BREA, Los Angeles County, California. *Meleagris californica*. All specimens from LACM. Numbers in parentheses are numbers of specimens of each element examined. Individual catalogue numbers available on request. Cranium (2). Premaxilla (3). Mandible (2). Fused Thoracic Vertebrae (1). Synsacral Vertebra (1). Pygostyle (1). Sternum (4). Furcula (4). Coracoid (56)—Tables 4, 5. Scapula (51)—Tables 6, 7, Fig. 9. Humerus (65)—Tables 8, 9. Ulna (64)—Tables 10, 11. Radius (74)—Tables 12, 13. Carpometacarpus (64)—Tables 14, 15. Pelvis (4). Femur (105)—Tables 16,

17. Tibiotarsus (74)—Tables 18, 19. Fibula (4). Tarsometatarsus (82)—Tables 20–22, Figs. 12, 14; Plate 25 of L. Miller (1909); Figs. 44, 45 of L. Miller (1940). All major elements illustrated in Pls. 1–13 of Howard (1927). L. Miller (1909) described this species as *Pavo californicus*, a phasianine. L. Miller (1916a) later erected the genus *Parapavo* for these specimens, which he regarded (L. Miller 1916a, 1916b, 1925) as being intermediate between *Pavo* and *Meleagris ocellata*, and more closely related to these two species than to *M. gallopavo*. Interestingly, L. Miller (1912:78) included “*Meleagris?*” alongside *Pavo californicus* in a list of birds from Rancho La Brea, with no mention of the elements involved. Wetmore (1924), referring only to a tarsometatarsus, regarded *Parapavo* not as a peacock but as a turkey intermediate between *Agriocharis (ocellata)* and *Meleagris (gallopavo)*, although closer to the latter. After a very thorough study of *Parapavo*, Howard (1927) agreed with Wetmore (1924), except for considering *Parapavo* more closely related to *Agriocharis* than to *Meleagris*. Although Howard (1927) considered *Parapavo* to be generically separable from *Meleagris gallopavo* and *M. ocellata*, only in the fibula did she find *M. californica* to be consistently generically distinct from both *M. gallopavo* and *M. ocellata*, although noting (Howard 1927:24) “Owing to the variability in the fibula of *Pavo* and *Agriocharis*, little import can be attached to this element.” Howard (1928), with a study of the premaxilla, gave support to her previous conclusion that *Parapavo* is different at the generic level from other turkeys. Sushkin (1928), comparing the coracoid, carpometacarpus, and tarsometatarsus of *M. californica* with those of *M. ocellata* and *Pavo*, concluded that *M. californica* is not related to *Pavo* but is sufficiently similar to *M. ocellata* that it could be congeneric. Wetmore (1931b), L. Miller (1942) and Brodkorb (1964a, b) all recognized *Parapavo*, while A. Miller and Bowman (1956) found no basis for a generic distinction in the tarsometatarsi of *Meleagris* and *Parapavo*.

Analysis of the various supposed generic characters of the turkey from Rancho La Brea is provided in the “Comparative Osteology” section, where *M. californica* is seen to lack characters that warrant generic separation from *M. gallopavo* or *M. ocellata*. *Meleagris californica* is not an unusual form at all, but simply another species of *Meleagris* with rather close affinities to other species of the genus (Tables 2 and 3), which it also resembles in size. Thus, I consider the genus *Parapavo* L. Miller to be a synonym of *Meleagris* Linnaeus.

IMPERIAL HIGHWAY (LACM 1052), Orange County, California. *Meleagris* sp. Radius (LACM 1052/2009)—Table 12. No characters apparent other than size. Referred to *Parapavo californicus* by Howard (1936) on the basis of characters herein regarded as inconsistent (see page 135). Also reported as *P. californicus* by L. Miller (1942), Brodkorb (1964a), and W. Miller (1971). L. Miller (1942) and Brodkorb (1964a) refer to this site as La Habra, California.

CARPINTERIA, Santa Barbara County, California. *Meleagris californica*. All specimens are LACM. Numbers in parentheses are numbers of specimens examined of each element. Individual catalogue numbers available on request. Coracoid (17)—Tables 4, 5. Scapula (10)—Tables 6, 7. Humerus (17)—Tables 8, 9. Ulna (22)—Tables 10, 11. Radius (16)—Tables 12, 13. Carpometacarpus (17)—Tables 14, 15. Femur (16)—Tables 16, 17. Tibiotarsus (21)—Tables 18, 19. Tarsometatarsus (16)—Tables 20–22. There are no significant qualitative or quantitative differences between these specimens and those of *M. californica* from Rancho La Brea. Reported as *Parapavo californicus* by L. Miller (1927, 1942), Wetmore (1931b), and Brodkorb (1964a).

WORKMAN AND ALHAMBRA STREETS (LACM 1023), Los Angeles County, California. *Meleagris* cf. *Meleagris*. Tibiotarsus (LACM 982)—Table 19. No characters apparent other than size. Howard (1936:250) found that this specimen “may be assignable to *Parapavo*, but unfortunately they do not possess any diagnostic generic characters by which to make definite identification.” Reported as *Parapavo californicus* by L. Miller (1942) and Brodkorb (1964a), and as cf. *Parapavo* by W. Miller (1971:55), who called this site “Workman and Alameda Sts.”

LA MIRADA, Los Angeles County, California. *Meleagris* cf. *M. californica*. Radius (LACM 2009)—Table 12. No characters apparent other than size. W. Miller (1971) referred a partial coracoid (not examined by me) and the radius from this site to *Parapavo californicus*.

POTTER CREEK CAVE, Shasta County, California. *Meleagris* sp. Coracoid (UCMP 1055/8368)—Table 5. Humerus (UCMP 1055/114545)—Table 9. Qualitatively separable from all species except *M. gallopavo* and *M. californica*, each of these specimens may also resemble either of the above two species in size. Reported as *Meleagris* sp. by L. Miller (1911); as “referable either to *Parapavo* or to *Meleagris*” by L. Miller (1925:67); and as *Parapavo californicus* by Brodkorb (1964a). Mention is made here of the report of “*Meleagris* sp.” from Hawver Cave, Eldorado County, California, by L. Miller (1912:75). I have not located the specimen involved, nor were any turkeys reported from Hawver Cave by L. Miller (1911) or Brodkorb (1964a).

AMERICAN FALLS, Power County, Idaho. *Meleagris gallopavo*. Tarsometatarsus (ISUM 1736)—Tables 20, 22. Reported also as *M. gallopavo* by Hopkins et al. (1969), this specimen agrees with tarsometatarsi of *M. gallopavo* in size, proportions, and in all characters except no. 4.

PAPAGO SPRINGS CAVE, Santa Cruz County, Arizona. *Meleagris* sp. Humerus (AMNH 8683, 8687)—Table 9. Femur (AMNH 8684, 8685)—Table 17. These specimens are indistinguishable from females of *M. gallopavo* or males of *M. crassipes*. North Papago Cave, which is an extension of Papago Springs Cave, contained a tarsometatarsus of *M. crassipes* (Rea this vol.).

ARIZPE, Sonora, México. *Meleagris* cf. *M. gallopavo*. Humerus (AMNH 6823)—Table 8. No character apparent other than size. Reported as *M. gallopavo* by Cracraft (1968). Also regarded as *Meleagris* cf. *M. gallopavo* by Rea (this vol.).

BURNET CAVE, Eddy County, New Mexico. *Meleagris* cf. *M. gallopavo*. Humerus (ANSP 14161)—Table 8. Carpometacarpus (ANSP 13495)—Table 15. Femur (ANSP 14134)—Table 17. Tibiotarsus (ANSP 14133)—Table 19. No characters apparent other than size. Reported as *M. gallopavo* by Schultz and Howard (1935). Although the humerus is too large for *M. crassipes*, a tarsometatarsus referable to *M. crassipes* has also been recovered from Burnet Cave (Rea this vol.). The stratigraphic positions of the various fossils of turkeys from Burnet Cave are unknown.

HOWELL'S RIDGE CAVE (Zeller-Howard pit), Grant County, New Mexico. (Includes both Pleistocene and Holocene strata.) *Meleagris* sp. Scapula (LACM 33889)—Table 7. Ulna (LACM 33891, 33892)—Table 11. *M. crassipes*. Coracoid (LACM 33890). The foramen of the scapula is very small and located nearer to the glenoid facet than in all other forms. Howard (1962:242) recorded these four specimens, saying that the scapula "resembles *Meleagris* more closely than *Parapavo* and is tentatively assigned to *M. gallopavo*." Brodkorb (1964a) listed *M. gallopavo* from this site. Neither the size nor qualitative characters of the ulnae or the scapula are diagnostic enough to refer these specimens to any species. The distinctive scapula could possibly represent *M. crassipes*, the scapula of which is not yet known. Amadeo M. Rea and I have jointly studied the coracoid and agree that it is of *M. crassipes*. Van Devender and Worthington (1977) present an analysis of the stratigraphy and chronology of Howell's Ridge Cave, which also contains, but not in the Zeller-Howard pit, a tarsometatarsus of *M. crassipes* (Rea this vol.).

SAN JOSECITO CAVE, Nuevo León, México. *Meleagris crassipes*. All specimens are LACM or UCMP. Numbers in parentheses are numbers of specimens examined of each element. Individual catalogue numbers available on request. Coracoid (4)—Tables 4, 5. Humerus (8)—Tables 8, 9. Ulna (10)—Tables 10, 11. Radius (2)—Tables 12, 13. Carpometacarpus (10)—Tables 14, 15. Femur (10)—Tables 16, 17. Tibiotarsus (6)—Tables 18, 19. Tarsometatarsus (16)—Tables 20–22, Figs. 10, 14; Figs. 44, 45 of L. Miller (1940). Described as *Meleagris crassipes* by L. Miller (1940), a name also used by L. Miller (1943) and A. Miller and Bowman (1956). Brodkorb (1964b), solely on the basis of characters of the tarsometatarsus that are largely refuted in the comparative osteology section of this paper, placed *M. crassipes* in *Agriocharis*. This generic reallocation was followed by Brodkorb (1964a) and Martin and Tate (1970). However, the "Great-footed Turkey" of San Josecito Cave (L. Miller 1943) is herein reassigned to *Meleagris*, though admittedly it deviates somewhat from other members of the genus, both in its small size and in its qualitative characters. It resembles the various forms of *Meleagris* more than *Rhegminornis* or *Proagriocharis* (Tables 2 and 3). If generic distinction of *M. crassipes* were warranted, the name *Agriocharis* is inapplicable because the type is *M. ocellata*, which is definitely referable to *Meleagris*. This is further supported by the relatively large qualitative difference between *M. crassipes* and *M. ocellata* (Tables 2 and 3).

The carpometacarpus and tarsometatarsus, elements which are clearly much larger in males than females in other species of turkeys, exhibit only a gradational change in size in the specimens of *M. crassipes* that I have examined (Tables 14, 15, 20, 21 herein; L. Miller 1943:157–158). Other elements in the fairly large series of turkey fossils from San Josecito Cave are separable, upon close inspection, into two size classes that presumably represent males and females. The tarsometatarsus of *M. crassipes* is quite distinctive, being very stout relative to its length (Table 22: B/A, C/A, D/A, L/A, M/A, N/A, P/A). Also, the stout spur core is located higher on the shaft (Table 22: F/A, G/A) than in other species. If differences approaching the magnitude of those of the tarsometatarsus were seen in other elements of *M. crassipes*, a case could be made for erecting a new genus for this small turkey, which appears to have survived well into the Holocene (Rea this vol.).

INGLESIDE, San Patricio County, Texas. *Meleagris gallopavo*. Coracoid (TMM 30967-1741)—Table 4. Tibiotarsus (TMM 30967-1139, 30967-1063B, 30967-1564)—Tables 18, 19. Tarsometatarsus (TMM 30967-1169, 30967-1467)—Tables 20, 22. Reported as *M. gallopavo* by Feduccia (1973) and Rea (this vol.), these fossils differ in certain measurements from Irvingtonian fossils, but agree in every way with Recent specimens of *M. gallopavo*.

SHEFFIELD GRAVEL PITS, Texas. *Meleagris* sp. Ulna (FAM 11249)—Table 10. No characters apparent other than size. The age of this deposit is uncertain, but it is probably late Pleistocene.

NORTH LIBERTY, St. Joseph County, Indiana. *Meleagris* sp. Humerus (USNM 17004)—Table 8. No character apparent other than size (immature). Reported as *M. gallopavo* by Wetmore (1945) and Brodkorb (1964a).

CARLISLE CAVE, Cumberland County, Pennsylvania. *Meleagris* cf. *M. gallopavo*. Humerus (USNM 345074, 345727)—Table 21. No characters apparent other than size. Reported as "the wild turkey" by Leidy (1889:2), and as *M. gallopavo* by Wetmore (1931b) and Brodkorb (1964a).

FRANKSTOWN CAVE, Blair County, Pennsylvania. *Meleagris* cf. *M. gallopavo*. All are CM 11053. Plate XVII of Peterson (1926). Humerus—Table 8. Pelvis. Femur—Table 16. Tibiotarsus—Table 18. Tarsometatarsus. No characters apparent other than size. Reported as "a large species undoubtedly belonging to the genus *Meleagris*" by Holland (1908:232, 1912:751), as *M. superba* by Peterson (1926) and Wetmore (1931b), and as *M. alta* by Brodkorb (1964a). After comparison with the description of *M. superba* (Cope 1871) and the illustrations of *M. superba* in Shufeldt (1915), Peterson (1926:254) said, "The only discrepancy appears to be the slightly shorter tarsometatarsus of the specimen from Frankstown Cave. . . . Whether or not *M. superba* Cope should be accepted as a valid species cannot be determined from the material available." I regard both *M. superba* and *M. alta* as synonyms of *M. gallopavo* (see below). The scapula reported from Frankstown Cave by Peterson (1926), seen to be foraminiferous in his Plate XVII, could not be located.

MANALAPAN, Monmouth County, New Jersey. *Meleagris gallopavo* (includes the synonyms *M. alta*, *M. celer*, and *M. superba*). Coracoid (AMNH 1443)—Table 4. Scapula (PU 22356)—Table 6. Humerus (?YPM 533–536, not examined by the author)—Table 8. Ulna (PU 22356)—Table 10. Radius (AMNH 2341)—Table 12. Femur (AMNH 1443, PU 22356)—Table 16. Tibiotarsus (AMNH 1443, PU 22356; also 1–3 specimens not examined by the author—?YPM 533–536)—Tables 18, 19. Tarsometatarsus (ANSP 12137; AMNH 2341; also 2 specimens not examined by the author—?YPM 533–536)—Tables 20–22. Otherwise harmless turkey bones from this site form the type series of three invalid species, namely *Meleagris altus* Marsh (1870b), *M. superba* Cope (1871), and *M. celer* Marsh (1872), all of which I regard as synonyms of *M. gallopavo*. Based on Marsh's descriptions, Shufeldt (1897) correctly synonymized *M. alta* and *M. celer* with *M. gallopavo*, but did not discuss *M. superba*. Shufeldt (1913), again criticizing Marsh for describing a new species on such fragmentary material, regarded *M. alta* to be a synonym of *M. superba*. Shufeldt (1913), after examination of the type tarsometatarsus of

M. celer, said that the specimen was not of any form of turkey, but he suggested that it was similar to a heron. Ironically, Shufeldt himself later (1917) described the tibiotarsus of a turkey from Vero, Florida, as a new species of heron ("*Ardea sellardsi*")! Later, Shufeldt (1915) again considered *M. alta* to be a synonym of *M. superba*, which was (p. 66), "a very tall turkey indeed" [Shufeldt's italics]. Peterson (1926) questioned the validity of *M. superba*. Wetmore (1931b) recognized *M. celer* and *M. superba*, but did not mention *M. alta*. A. Miller and Bowman (1956) noted that *M. celer* was similar in size to *M. gallopavo* and may be synonymous. Howard (1963) suspected that *M. celer* was the female of *M. superba*, but Brodkorb (1964a) correctly regarded *M. superba* and *M. celer* as subjective synonyms of *M. alta* Marsh, a treatment which must be followed regardless of the affinities of *M. alta*. Martin and Tate (1970) followed Brodkorb (1964a) in recognizing *M. alta*.

A cast of a "type" tarsometatarsus of *M. alta* Marsh (ANSP 12137; for history of this specimen, see Olson and Gillette 1978) reveals nothing to distinguish it from *M. gallopavo*. Marsh (1872:260) reported the absence of a bridge over the inner canal of the hypotarsus in *M. alta*, saying "The bridge, if it existed in an ossified condition, was less massive than in the wild turkey; otherwise some portions of it would have been preserved in the present specimens." However, the absence of the bridge is simply due to breakage of the plantar portion of the hypotarsus, thus exposing the inner canal.

Marsh (1872) also described the tarsometatarsus of *M. alta* as being slender and elongated. This cannot be determined from the available cast, but the length reported by Marsh is within the range of both Pleistocene and Recent specimens of *M. gallopavo*. The supposedly lower placement of the spur core of *M. alta* reported by Marsh is within the range of *M. gallopavo* (Table 22: G/A). The large pneumatic foramen in the coracoid of *M. superba* reported by Cope (1871) is probably due to individual variation (see character 2 of the coracoid.)

My measurements of the bones of *M. alta* never exceed the length of one or more modern specimens of *M. gallopavo*, and, in only one case (Table 4) are the measurements of Cope (1871), Marsh (1872), or Shufeldt (1915) greater than those of modern *M. gallopavo*. As their measurements often tend to be greater than my measurements of apparently the same bones, and are also often only estimations, this slight difference is of little or no significance.

Turkey fossils from Manalapan in the Princeton University Museum of Natural History, which are probably some of the same specimens used by Cope and Marsh, are not separable from *M. gallopavo*. These 12 specimens were in a tray that contained the type femur of *Grus proavus* Marsh from Manalapan, and an old pencilled slip that reads "Dr. Thompson probably." Dr. C.C. Thompson collected the specimens from which *M. alta*, *M. superba*, and *M. celer* were described. I have examined two lots of turkey fossils in the collection of the American Museum of Natural History with preservation identical to that of the Princeton specimens (dark brown, brittle, poorly mineralized). One lot (AMNH 2341), labelled "Bird bones.—Undetermined. Probably of as many individuals. Pleistocene. Freehold? New Jersey," contained two tarsometatarsi and a radius of a turkey; the other (AMNH 1443) is labelled "*Meleagris superba* Cope. Femur, tibia, coracoid. Post-Pliocene. Freehold, Monmouth Co., N.J. Coll. Dr. C.C. Thompson." These specimens resemble *M. gallopavo* both

qualitatively and quantitatively as do those from Princeton. *M. alta* Marsh, *M. superba* Cope, and *M. celer* Marsh are thus placed in synonymy of *M. gallopavo* Linnaeus because of their lack of distinguishing features.

Brodkorb (1964a) reported two other localities for *M. alta*, both of which are discussed more fully above. A carpometacarpus from Port Kennedy Cave, Pennsylvania, is herein reported as *Meleagridinae*, cf. *Meleagris*, and the fossils from Frankstown Cave, Pennsylvania, are regarded herein as *Meleagris* cf. *M. gallopavo*.

The following 14 Rancholabrean localities in Florida have mammalian faunas that have made possible their correlation, as summarized by Webb (1974:13). In no case have any meleagridine fossils contradicted Webb's correlation, thus further supporting his proposed sequence of local faunas. The names of sites that are usually followed by IA, IIA, etc. are not so designated in certain cases because such information did not accompany the specimens and could not be derived from the associated data.

BRADENTON, Manatee County. *Meleagris* sp. Tarsometatarsus (USNM 12074)—Table 20. No characters apparent other than size. Reported as *M. gallopavo* by Wetmore (1931a, b) and Brodkorb (1964a).

ROCK SPRING, Orange County. *Meleagris* cf. *M. gallopavo*. Coracoid (PB 7917)—Table 5. Humerus (PB 7918)—Table 9. Radius (PB 7919–7921)—Tables 12, 13. Carpometacarpus (PB 1481, 7922)—Table 14. Tibiotarsus (PB 7923)—Table 18. These fossils agree closely with Recent specimens of *M. gallopavo*, but differ from Inglis and Coleman specimens only in character 11 of the coracoid. Reported as *M. gallopavo* by Woolfenden (1959) and Brodkorb (1964a).

WITHLACOOCHIEE RIVER, Citrus County. *Meleagris* sp. Tarsometatarsus (PB 8444)—Tables 20, 22. No characters apparent other than size.

HAILE VIIA, Alachua County. *Meleagris* sp. Carpometacarpus (PB 8497)—Table 15. Femur (PB 1263)—Table 17. This carpometacarpus differs from that of all other species in having a larger pisiform process. Otherwise it is similar to specimens from Coleman and of Recent *M. gallopavo*. Reported as *M. gallopavo* by Brodkorb (1964a).

REDDICK IB, Marion County. *Meleagris* cf. *M. gallopavo*. Coracoid (PB 705, 9012)—Table 5. Scapula (PB 1028)—Table 7. Humerus (PB 1222)—Table 8. Ulna (PB 1264)—Table 10. Radius (PB 846)—Table 12. Carpometacarpus (PB 1756, 9013–9015, UF 2437)—Tables 14, 15. Femur (PB 1094, 9017, 9018, UF 2437)—Tables 16, 17. Tibiotarsus (PB 291, 699, 1123)—Table 18. Tarsometatarsus (PB 292, 494, 685)—Tables 20, 22. This series of specimens falls within the range of quantitative and qualitative variation of Recent *M. gallopavo* with two exceptions: the humerus resembles specimens from Inglis in character 3; the tarsometatarsus resembles specimens of *M. crassipes* in character 3. These differences are outweighed by the similarity in size of these fossils, especially elements of the leg, to Pleistocene and Recent specimens of *M. gallopavo*. Reported as *M. gallopavo* by Brodkorb (1957, 1964a) and Hamon (1964). Although listed herein as "Reddick IB," some of these fossils are labelled simply "Reddick" or "Reddick I" and may be from another of the several localities within the Reddick limestone mine.

MELBOURNE, Brevard County. *Meleagris* cf. *M. gallopavo*. Scapula (USNM 17035, 17036)—Table 7. Humerus (USNM 12123)—Table 8. Ulna (USNM 12113). Carpometacarpus (USNM 17028, 17038, 17039)—Tables 14, 15. Tibiotarsus (USNM 12114, 17034). Tarsometatarsus (USNM 12108, 17037, 17040)—Table 20. No characters apparent other than size. Reported as *M. gallopavo* by Wetmore (1931a, b) and Brodkorb (1964a).

ARREDONDO, Alachua County. *Meleagris* cf. *M. gallopavo*. Humerus (PB 1630)—Table 8. No characters apparent other than size. Reported as *M. gallopavo* by Brodkorb (1959, 1964a).

SABERTOOTH CAVE, Citrus County. *Meleagris* cf. *M. gallopavo*. Tarsometatarsus (USNM 12188)—Tables 20, 22. No characters apparent other than size. Reported as *M. gallopavo* by Wetmore (1931a, b) and Brodkorb (1964a).

AUCILLA RIVER IA, Jefferson County. *Meleagris gallopavo*. Humerus (USNM 209602)—Table 8. Radius (USNM 209709)—Table 12. Tibiotarsus (USNM 209607, 209705)—Tables 18, 19. Tarsometatarsus (USNM 209605, 209609)—Tables 20, 22. Referral of these specimens to *M. gallopavo* is based on size and proportions of the tarsometatarsus, in which they differ from those of Inglis or Coleman.

ICHETUCKNEE RIVER, Columbia County. *Meleagris gallopavo*. All specimens have either UF or PB numbers. Numbers in parentheses are numbers of specimens examined. Individual catalogue numbers available on request. Sternum (1). Coracoid (11)—Tables 4, 5. Scapula (1)—Table 7. Humerus (11)—Tables 8, 9. Ulna (9)—Tables 10, 11. Radius (1)—Table 12. Carpometacarpus (14)—Tables 14, 15. Femur (8)—Tables 16, 17. Tibiotarsus (37)—Tables 18, 19. Tarsometatarsus (44)—Tables 20–22. This large series of fossils generally agrees very closely with specimens of Recent *M. gallopavo* and differs in many ways from the fossils from Inglis or Coleman. They usually resemble *M. g. silvestris* in size and proportions more than *M. g. osceola*. Reported as *M. gallopavo* by Wetmore (1931a, b), McCoy (1963), Brodkorb (1964a), and Campbell (this vol.).

KENDRICK IA, Marion County. *Meleagris* sp. Tibiotarsus (PB 1410)—Table 19. Tarsometatarsus (PB 1409)—Table 20. These fragmentary specimens resemble *M. gallopavo* except in character 4 of the tarsometatarsus. Reported as *M. gallopavo* by Brodkorb (1964a).

VERO, Indian River County. *Meleagris* cf. *M. gallopavo*. Carpometacarpus (PB 8467)—Table 15. No characters apparent other than size. Shufeldt (1917) unknowingly was the first to report a turkey from Vero, describing the worn distal half of a meleagridine tibiotarsus as *Ardea sellardsi*, a supposed new species of heron. Wetmore (1931a) recognized Shufeldt's interordinal error and synonymized *Ardea sellardsi* with *Meleagris gallopavo*, and also reported several other specimens from this site as *M. gallopavo*. Also listed as *M. gallopavo* by Wetmore (1931b) and Brodkorb (1964a).

SEMINOLE FIELD, Pinellas County. *Meleagris gallopavo* (includes the synonym *M. tridens*). All are USNM 244387 except a humerus (USNM 12207), a tibiotarsus (USNM 12214), and a tarsometatarsus (USNM 12052). Numbers in parentheses are numbers of specimens examined. Coracoid (3)—Tables

4, 5. Scapula (1)—Table 7. Humerus (3)—Tables 8, 9. Ulna (7)—Tables 10, 11. Carpometacarpus (10)—Tables 14, 15. Femur (8)—Tables 16, 17. Tibiotarsus (7)—Tables 18, 19. Tarsometatarsus (28)—Tables 20–22, Fig. 13; Fig. 13 of Wetmore (1931a). This series of fossils, reported as *M. gallopavo* (all specimens except USNM 12052) and *M. tridens* Wetmore (USNM 12052 only) by Wetmore (1931a, b) and Brodkorb (1964a), agrees qualitatively and quantitatively with specimens of Recent *M. gallopavo*. Brodkorb (1964a) noted that *M. tridens* may merely be a specimen of *M. gallopavo* with an abnormal development of three tarsal spurs. Williams (1967) documented the occurrence of double spurs in living *M. g. osceola* from Florida. There is also a tarsometatarsus from Inglis (UF 20680) with two spurs. Figure 13 illustrates the holotype of *M. tridens* next to a specimen of *M. g. osceola* with three spurs, and a specimen of *M. ocellata* with two spurs. I agree with Wetmore (1931a) in noting the lack of differences other than the aberrant spurs between *M. tridens* and *M. gallopavo*. *Meleagris tridens* is therefore a synonym of *M. gallopavo*.

Mention may be made here of a record of *M. gallopavo* at "Pleistocene cavern deposits at Ocala, Florida" by Shufeldt (1918:358; for further references to this site, see Ray 1957). These specimens could not be located at the United States National Museum, where Shufeldt said they would probably be deposited. Pending re-examination of these specimens, this record should not be considered as a valid occurrence of *M. gallopavo*.

The following are 13 Pleistocene localities in Florida whose faunas are either very limited or unstudied. All are regarded herein as Rancholabrean (*M. Frazier* and S.D. Webb pers. comm.), an age that is not refuted by the turkey specimens from these sites. Because their ages are not as refined as the other Floridian sites discussed above, they are simply listed in alphabetical order.

BOWMAN IA, Putnam County. *Meleagris* cf. *M. gallopavo*. Tarsometatarsus (PB 8606)—Tables 20, 22. No characters apparent other than size.

DAVIS QUARRY, Citrus County. *Meleagris gallopavo*. Coracoid (UF 22702, 22703)—Table 4. Femur (UF 22074)—Table 16. These specimens agree with those of *M. gallopavo* in all ways, and differ from specimens from Inglis and Coleman in character 11 of the coracoid.

ECONFINA RIVER, Taylor County. *Meleagris* sp. Tibiotarsus (USNM 243754)—Table 19. No characters apparent other than size.

FLORIDA LIME COMPANY, Marion County. *Meleagris* sp. Coracoid (PB 8439)—Table 5. Radius (PB 8440)—Table 12. Carpometacarpus (PB 8441, 8442)—Table 14. The coracoid resembles those from Coleman, not those of Recent *M. gallopavo*, in character 1, while the opposite is true in character 10. No other characters are apparent. Reported as *M. gallopavo* by Brodkorb (1964a).

HAILE IIA, Alachua County. *Meleagris* cf. *M. gallopavo*. Ulna (PB 1577)—Table 10. Tarsometatarsus (PB 1575). No characters apparent other than size. Reported as *M. gallopavo* by Brodkorb (1964a).

HOG CREEK, Sarasota County. *Meleagris* sp. Femur (USNM 12096)—Table 17. Tibiotarsus (USNM 12098)—Table

19. No characters apparent other than size. Reported as *M. gallopavo* by Wetmore (1931a, b) and Brodkorb (1964a).

MEFFORD CAVE I, Marion County. *Meleagris* cf. *M. gallopavo*. All are UF 2119. Premaxilla. Mandible. Coracoid—Table 4. Scapula—Table 7. Ulna—Table 10. Radius—Table 12. Carpometacarpus—Table 14. Synsacrum. Pelvis. These elements agree with those of Recent *M. gallopavo* in all respects except that the premaxilla is wider.

OAKHURST QUARRY, Marion County. *Meleagris* sp. Tibiotarsus (PB 8495)—Table 18. No characters apparent other than size.

ST. MARK'S RIVER, Leon and Wakulla Counties. *Meleagris* sp. Femur (USNM 209922)—Table 16. Tibiotarsus (USNM 209921). No characters apparent other than size.

SANTA FE RIVER IA, Gilchrist County. *Meleagris* cf. *M. gallopavo*. Femur (UF 22080)—Table 17. Tibiotarsus (UF 10664)—Table 18. Tarsometatarsus (UF 10667)—Tables 20, 22. Although these specimens lack qualitative distinctions, their size and proportions, especially of the tarsometatarsus, are more similar to those of Recent *M. gallopavo* than to those of Inglis or Coleman fossils. This site contains a mixture of Blancan and Rancholabrean fossils (Webb 1974), but the turkey fossils are regarded herein as Rancholabrean because of their similarity to *M. gallopavo*. These are probably the same specimens as those upon which Brodkorb (1963) reported *M. gallopavo* from Santa Fe I.

SANTA FE RIVER IVA, Gilchrist County. *Meleagris* sp. Ulna (UF 16806)—Table 10. Femur (UF 22079). Tibiotarsus (UF 16806, 22079)—Tables 18, 19. No characters apparent other than size.

STEINHATCHIE RIVER, Taylor and Dixie Counties. *Meleagris* cf. *M. gallopavo*. Radius (USNM 243755)—Table 12. No characters apparent other than size.

WEKIVA RUN III, Levy County. *Meleagris* sp. Tibiotarsus (UF 14214)—Table 18. No characters apparent other than size.

HOLOCENE

WACISSA RIVER, Jefferson County, Florida. *Meleagris gallopavo*. Tarsometatarsus (USNM 239842)—Tables 20, 22. This specimen differs from those of Inglis and Coleman and agrees with Recent *M. gallopavo* in size and proportions.

NICHOL'S HAMMOCK, Dade County, Florida. *Meleagris gallopavo*. All are UF 22075. Numbers in parentheses are numbers of specimens examined. Coracoid (5)—Tables 4, 5. Scapula (1)—Table 9. Ulna (5)—Table 11. Radius (1)—Table 12. Carpometacarpus (3)—Tables 14, 15. Femur (2)—Table 17. Tibiotarsus (8)—Tables 18, 19. Tarsometatarsus (3)—Table 21. This series agrees in every way with specimens of Recent *M. gallopavo*, being more similar in size to those of *M. g. osceola* than to those of late Pleistocene *M. gallopavo*, such as from Ichetucknee River. Reported as *M. gallopavo* by Hirschfeld (1968).

GOOD'S SHELLPIT, Volusia County, Florida. *Meleagris gallopavo*. Coracoid (PB 1709, 2163)—Tables 4, 5. Humerus (PB 1646, 1723, 1734, 1776)—Tables 8, 9. Ulna (PB 1757, 1828)—Tables 10, 11. Carpometacarpus (PB 1617, 1725)—

Tables 14, 15. Femur (PB 1698, 1710, 1735, 1777, 1810)—Tables 16, 17. Tibiotarsus (PB 1758, 1778)—Tables 18, 19. These specimens agree in every way with those of Recent *M. gallopavo*. Reported as *M. gallopavo* by Brodkorb in Neill et al. (1956) and by Brodkorb (1964a).

SILVER GLEN SPRINGS, Lake County, Florida. *Meleagris* sp. Femur (PB 8498, 8499)—Table 16. No characters apparent other than size. Reported as *M. gallopavo* by Brodkorb in Neill et al. (1956) and Brodkorb (1964a).

BUFFALO SITE, Putman County, West Virginia. *Meleagris gallopavo*. All specimens are SBU. Numbers in parentheses are numbers of specimens examined. Individual catalogue numbers available on request. Coracoid (234)—Tables 4, 5. Scapula (30)—Tables 6, 7. Humerus (277)—Tables 8, 9. Ulna (116)—Tables 10, 11. Radius (69)—Tables 12, 13. Carpometacarpus (308)—Tables 14, 15. Femur (63)—Tables 16, 17. Tibiotarsus (113)—Tables 18, 19. Tarsometatarsus (131)—Tables 20–22. All major elements are illustrated in Figs. 1–10 of Kooliath (1975). This large series of bones, although representing birds eaten by 17th century Amerindians, are regarded by Kooliath (1975) and me as representing a wild population of *M. gallopavo*. They thus provide an unexcelled sample of *M. g. silvestris* from the period prior to extensive contact with Europeans. These bones were measured and described by Kooliath (1975), who compared them with modern *M. g. silvestris* from New York, finding the modern birds to be 2 to 3 percent smaller in all linear measurements (generally only total length considered) than those of AD 1650. My data include more types of measurements on a larger number of bones and yield the same slight difference in size. Kooliath suggested that selection for increased wildness because of increased hunting pressure since European contact may be the main factor leading to the apparent reduction in size.

HARTMAN'S CAVE, Monroe County, Pennsylvania. *Meleagris gallopavo*. Coracoid (ANSP 761)—Table 4. Humerus (ANSP 758–760, 771)—Tables 8, 9. Carpometacarpus (ANSP 753)—Table 14. Tibiotarsus (ANSP 753)—Table 19. Tarsometatarsus (ANSP 753)—Tables 20–22. Originally reported as *M. gallopavo* by Leidy (1889), who noted that this deposit, apparently collected without any stratigraphic control, contained extinct genera of mammals (*Mylohyus*, *Castoroides*) as well as advanced Amerindian artifacts, including ceramics. Although Leidy (1889) gave no provenience for the turkey bones contained therein, this site is listed as a Pleistocene record for *M. gallopavo* by both Wetmore (1931b) and Brodkorb (1964a). Upon examination of the specimens involved, I discovered that some of the turkey bones not only bear butcher marks made from steel knives, but also have obviously been shot by a shotgun, lead pellets from which are still contained within several of the bones. Thus Hartman's Cave can no longer be regarded as a Pleistocene locality for *M. gallopavo*. The lack of mineralization of these bones further supports their recency of deposition, as does the fact that they are inseparable from modern skeletons of *M. gallopavo*. The alternative hypothesis of Pleistocene firearms is rejected.

HOLOCENE MAYAN ARCHAEOLOGICAL SITES

DZIBILCHALTÚN, Yucatán, México. *Meleagris ocellata*. All specimens have UFZA numbers. Coracoid (31 M-101, 603

M-825, 726 M-626)—Tables 4, 5. Humerus (728 M-567, 172 M-101)—Table 8. Ulna (M-110, 339 M-176)—Table 10. Carpometacarpus (M-110, 341 M-176, 164 M-101, 724 M-558)—Table 14. Femur (517 M-179)—Table 17. Tibiotarsus (340 M-176, 759 M-176, 174 M-101, 335 M-1336)—Tables 18, 19. Tarsometatarsus (775 M-300, 170 M-101, 725 M-645, 401 M-108D, 783 M-2027)—Tables 20–22. Reported as *M. ocellata* by Wing and Steadman (in press), this series agrees with modern skeletons of *M. ocellata*.

MAYAPÁN, Yucatán, México. *Meleagris ocellata*. All are MCZ 2536–2539, 2543, 2445. Numbers in parentheses are numbers of specimens examined. Coracoid (41)—Tables 4, 5. Scapula (39)—Tables 6, 7. Humerus (31)—Tables 8, 9. Carpometacarpus (27)—Tables 14, 15. Tarsometatarsus (20)—Tables 20–22. This very large series of bones, reported as *M. ocellata* by Pollock and Ray (1957) and as *Agriocharis ocellata* by Brodkorb (1964a), includes many specimens that are larger and stouter than the corresponding elements in comparative skeletons of wild *M. ocellata*. This is strong evidence for artificial fattening of these birds, such as by feeding them corn, in combination with a sedentary existence. This in turn suggests that these birds were kept in some state of confinement by the people of Mayapán. To what extent *M. ocellata* was tamed at Mayapán is presently impossible to ascertain. *Meleagris ocellata* is famous for its wildness, and numerous references attest to the impossibility of taming this beautiful bird. However, an example of its potential to attain at least some degree of tameness has been observed by the author at Tikal National Park, Petén, Guatemala, where because of protection from hunting for about 20 years, the two local flocks of *M. ocellata* living near the ruins are so tame as to come up to homes and be fed corn and rice by the residents. These birds may easily be approached to within about 8 meters, while birds from flocks in adjacent areas, which are subjected to hunting, are extremely wary and fly or run away at first sight of a person (Steadman et al. 1979). The presence also at Mayapán of apparently wild *M. ocellata* suggests that wild birds were eaten along with those supposedly reared. The sample of wild turkeys hunted by the Maya was probably biased toward those birds that fed heavily in the corn fields and were thus in good flesh.

CANCÚN ISLAND, Quintana Roo, México. *Meleagris* cf. *M. ocellata*. Tarsometatarsus (UFZA Q-509)—Table 20. No characters apparent other than size (immature).

TULÚM, Quintana Roo, México. *Meleagris* cf. *M. ocellata*. Ulna (MCZ 2513)—Table 10. Carpometacarpus (MCZ 2531)—Table 15. These specimens lack distinctive qualitative characters, and are very tentatively referred to *M. ocellata* on the basis of their very small size.

BARTON RAMIE SITE, Belize. *Meleagris* cf. *M. ocellata*. Tarsometatarsus (PB 8492)—Table 21. No characters apparent other than size. Reported as *Agriocharis ocellata* by Brodkorb (1964a).

MACANCHÉ, Petén, Guatemala. *Meleagris* cf. *M. ocellata*. Both are UFZA unnumbered. Carpometacarpus—Table 14. Tibiotarsus—Table 18. No characters apparent other than size.

SYSTEMATICS

The nomenclatural status of the turkeys from each of the sites listed above and in Table 1 is based on data in the Comparative Osteology section (roughly quantified in Tables 2 and 3) and also on the measurements presented in Tables 4–22. As previously noted, turkeys are very similar osteologically, and most quantitative differences are only average ones. With the exception of the problematical *Rhegminornis calobates*, from which only one element is known, each taxon of turkey averages more than partial agreement (i.e., a similarity index value greater than 50) with all other known forms. Tables 2 and 3 are based only on those characters in which a difference was seen between at least two forms. The degree of similarity would be much higher if previously published characters that do not hold were included. It must be understood that biases exist in Tables 2 and 3 because of differences in elements and characters being compared between any two taxa. These tables present only an approximate, but useful, estimate of the degree of similarity between the various forms of turkeys.

Recognition of the genera *Rhegminornis* and *Proagriocharis* is based on their low overall resemblance to other forms (Tables 2–4, 20–22). A more detailed discussion of their affinities is given in the accounts of individual sites above. *Meleagris* is the only other genus recognized in this study. It includes all known diagnostic turkey fossils from Blancan through Recent times, as well as the two living species. The two other genera recognized by Brodkorb (1964a) and most other workers, *Agriocharis* and *Parapavo*, are herein regarded as synonyms of *Meleagris*, for reasons outlined as follows.

Agriocharis was originally diagnosed on the external morphology of *M. ocellata*. Chapman (1896:288) described the new genus as follows: "The differences in the form and distribution of the warty excrescences of the head and neck, and in the character of the erectile appendages of the forehead, the more highly graduate tail and the more rounded rectrices, the absence of a beard in the male and the presence of rudimentary spurs in the female are all characters which entitle *ocellata* to generic distinction. . . ." Rudimentary spurs in females, discussed earlier in the Comparative Osteology section, are not always present in females of *M. ocellata*, and they may be present in females of *M. gallopavo*. *Meleagris ocellata* is characterized by a lower average amount of similarity to other turkeys than any other post-Hemphillian form (Tables 2 and 3), being approached in this respect only by *M. crassipes*. However, *M. ocellata* resembles post-Hemphillian forms more than it does *Rhegminornis calobates* or *Proagriocharis kimballensis*, and the rather low level of agreement between *M. ocellata* and *M. gallopavo* is skewed downward because complete skeletons of these living species permitted me to find characters that were imperceptible in fossil forms. In Table 2, *M. ocellata* and *M. gallopavo* are compared in 85 different characters, ten more than are used between any other forms. All of these ten characters have a similarity value of 0 to 50. Regardless, the amount of dissimilarity between the various Pleistocene and Recent forms and *M. ocellata* is not enough to justify generic separation. Although both *M. ocellata* and *M. crassipes* appear to be somewhat unique within the genus, I feel that the similarities between these species, which in the past have been largely overlooked in a search for differences,

may best be emphasized by their inclusion in a single genus. Ridgway (Ridgway and Friedmann 1946:458) recognized *Agriocharis* but said, "Agriocharis is, in fact, so closely related to *Meleagris* that I am somewhat doubtful as to the expediency of recognizing it as a genus." Paynter (1955) found the characters of *M. ocellata* to be of no more than specific value after several years of field and museum work with the birds of the Yucatán peninsula. Nearly two months of observation of *M. ocellata* at Tikal, Guatemala, has revealed many similarities between the life histories of *M. ocellata* and *M. gallopavo* (Steadman et al. 1979). Thus, non-osteological data exist that support the inclusion of *Agriocharis* in *Meleagris*.

Meleagris californica is more similar to *M. gallopavo* than to *M. ocellata* (Tables 2 and 3), and is consistently intermediate between the two living species in size (Tables 4–22). L. Miller (1916a) said that because *M. californica* was intermediate between *M. ocellata* and *Pavo cristatus*, species that are in different subfamilies, it was necessary to erect the genus *Parapavo* for that species. Howard (1927) correctly regarded *M. californica* as distinctly meleagridine, not phasianine. Howard (1927) considered *M. (Parapavo) californica* to be generically separable from *M. gallopavo* and *M. ocellata*, although resembling *M. ocellata* more than *M. gallopavo*, and stated (1927:27): "Grouping the characters for each element together, we find that the following elements [of *M. californica*] possess characters of each of the modern genera: sternum, coracoid, humerus, radius, femur, tibiotarsus, tarsometatarsus; another element (furcula) is in all characters nearer *Meleagris* [*gallopavo*]; others in all characters approach *Agriocharis* [*ocellata*]: skull, scapula, ulna. The remaining elements either possess characters distinct from both genera (fibula), or have structure features common to all three genera (carpometacarpus, pelvis, pygostyle)." Thus, *M. californica* was supposedly distinct from both *M. gallopavo* and *M. ocellata* only in the fibula. However, the fibula of these species is not as definitely different as stated by Howard (see page 137). The lack of diagnostic features in *M. californica*, especially as compared to *M. gallopavo*, strongly argues for its inclusion in *Meleagris*. A. Miller and Bowman (1956) found no generic differences between the tarsometatarsi of *Meleagris (gallopavo)* and *Parapavo (californica)*. I concur with this and add that I cannot find generic differences between *M. californica* and *M. gallopavo* in any skeletal element.

The general recognition of the genus *Parapavo* for the past 60 years can perhaps be attributed largely to two factors. First, it was originally described as a peacock in the genus *Pavo* (L. Miller 1909); when its true subfamilial affinities became apparent (L. Miller 1916a), to synonymize *Pavo* with a living genus of turkey probably seemed to be a bit drastic, if indeed it was even considered. Second, throughout the subsequent systematic history of *M. californica* (Howard 1927, 1928; Sushkin 1928), the two living species of turkeys were placed in separate genera. Thus comparisons among *M. californica*, *M. gallopavo*, and *M. ocellata* were carried out with a bias toward thinking in terms of differences on the generic level (*Parapavo* vs. *Meleagris* vs. *Agriocharis*). I have shown above that the majority of those differences either do not hold at all, or are only average differences that must therefore be considered on a specific, not a generic, level.

REVISED CLASSIFICATION

Order Galliformes (Temminck 1820)

Family Phasianidae Vigors 1825

Subfamily Meleagridinae (Gray 1840)

Rhegminornithidae Wetmore 1943 (23 June), Proc. New England Zool. Club, vol. 22, p. 60 (type *Rhegminornis* Wetmore).—Rhegminornithinae Brodkorb 1967 (12 June), Bull. Florida State Mus., Vol. 11, no. 3, p. 201 (new rank).

Genus *Rhegminornis* Wetmore 1943

Rhegminornis Wetmore 1943 (type *Rhegminornis calobates* Wetmore)

Rhegminornis calobates Wetmore 1943

Rhegminornis calobates Wetmore 1943 (23 June), Proc. New England Zool. Club, vol. 22, p. 61, pl. 9, figs. 1–5 (type from Thomas Farm, distal end of right tarsometatarsus, Mus. Comp. Zool. no. 2331).—*Rhegminornis calobates*, Olson and Farrand 1974 (June), Wilson Bull., vol. 86, no. 2, p. 114 (reassignment from Charadriiformes to Meleagridinae).

Early Miocene (Hemingfordian): Thomas Farm local fauna. Florida: Gilchrist County: Thomas Farm, 8 miles N of Bell.

Genus *Proagriocharis* Martin and Tate 1970

Proagriocharis Martin and Tate 1970 (type *Proagriocharis kimballensis* Martin and Tate)

Proagriocharis kimballensis

Martin and Tate 1970

Proagriocharis kimballensis Martin and Tate 1970 (5 June), Wilson Bull., vol. 82, no. 2, p. 215, fig. 1 (type from S of Lime Creek, left coracoid, Univ. Nebraska State Mus. no. 20033).

Late Miocene or early Pliocene (Hemphillian): lower part of Kimball Formation, Univ. Nebraska Coll. Loc. Ft-40. Nebraska: Frontier County: S of Lime Creek.

Genus *Meleagris* Linnaeus 1758

Meleagris Linnaeus 1758 (type *Meleagris gallopavo* Linnaeus)

Agriocharis Chapman 1896 (type *Meleagris ocellata* Cuvier)

Eumeleagris Coues 1903 (type *Meleagris ocellata* Cuvier)

Meleagrops (Marsh ms.) Shufeldt 1913 (type *Meleagris celer* Marsh)

Parapavo L. Miller 1916a (type *Pavo californicus* L. Miller)

Meleagris progenes (Brodkorb 1964)

Meleagris gallopavo; Meleagrididae, sp.?, Wetmore 1944. Univ. Kansas Sci. Bull., vol. 30, pt. 1, no. 9, p. 98 (Rexroad ranch, misidentification).

Agriocharis progenes Brodkorb 1964b (4 Nov.), Quart. Jour. Florida Acad. Sci., vol. 27, no. 3, p. 223, pl. 1, figs. 1–3 (type from Rexroad ranch, distal part of right tarsometatarsus, Univ. Michigan Mus. Paleo. no. 31034).

Late Pliocene (Blancan): Rexroad Formation, Rexroad local fauna. Kansas: Meade County: Rexroad ranch, locality 3.

Meleagris leopoldi

A. Miller and Bowman 1956

Parapavo californicus, L. Miller and Johnston 1937, Condor, vol. 39, no. 5, p. 229 (Cita Canyon, misidentification).

cf. *Meleagris*, Johnston and Savage 1955, Univ. California Publ., Geol. Sci., vol. 31, no. 2, p. 39.

Meleagris leopoldi A. Miller and Bowman 1956 (5 March), Wilson Bull., vol. 68, no. 1, p. 42, figs. 1a–1c (type from Newton Harrell-Edd Reynolds ranch, distal end of right tarsometatarsus, Panhandle Plains Hist. Mus. no. 753)—*Agriocharis leopoldi*, Brodkorb 1964a (26 June), Bull. Florida State Mus., vol. 8, no. 3, p. 324.—Brodkorb 1964b (4 Nov.), Quart. Jour. Florida Acad. Sci., vol. 27, no. 3, p. 225.

Late Pliocene (Blancan): Cita Canyon beds. Texas: Randall County: Cita Canyon local fauna, UCMP locality V-3721, at Newton Harrell-Edd Reynolds ranch, 2.2 km S and 21 km E of Canyon.

Meleagris anza (Howard 1963)

Agriocharis anza Howard 1963 (30 Dec.), Los Angeles County Mus., Contr. in Sci., no. 73, p. 19, pl. 3, fig. A (type from Arroyo Tapiado, right humerus, Los Angeles County Mus. no. 3753).

Early Pleistocene (Irvingtonian): upper Palm Spring Formation, upper 4000 ft. of Vallecito-Fish Creek section, Nat. Hist. Mus. Los Angeles County Loc. no. 1358. California: San Diego County: Anza-Borrego State Park: Arroyo Tapiado.

Meleagris gallopavo Linnaeus 1758

Meleagris gallopavo Linnaeus 1758, Systema Naturae, ed. 10, vol. 1, p. 156 (type from México).

Meleagris altus Marsh 1870a (March), Proc. Acad. Nat. Sci. Philadelphia, p. 11 (nomen nudum).—Marsh 1870b (July), Amer. Naturalist, vol. 4, no. 5, p. 317 (type from Manalapan, New Jersey, portions of 3 skeletons).—Marsh 1872 (October), Amer. Jour. Sci., ser. 3, vol. 4, no. 22, p. 260 (descr. humerus, coracoid, femur, tibia, tarsometatarsus).—Mercer 1899, Jour. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 11, pt. 2, p. 280 (referred tarsometatarsus from Port Kennedy Cave, Pennsylvania).

Meleagris superbus Cope 1871, Trans. Amer. Philos. Soc., n.s., vol. 14, pt. 1, p. 238 (types from Manalapan, New Jersey, 2 tibiae, 2 femora, 1 coracoid).—Peterson 1926, Ann. Carnegie Mus., vol. 16, no. 2, p. 254, pl. 17, figs. 1–10 (referred 1 scapula, 1 humerus, 1 pelvis, 2 femora, 2 tibiotarsi, 2 tarsometatarsi from Frankstown Cave, Pennsylvania).—*Meleagris superba*, Shufeldt 1915, Trans. Connecticut Acad. Arts Sci., vol. 19, p. 66, pl. 10, figs. 71–73; pl. 11, figs. 74–77 (Marsh's types from Manalapan, 3 humeri, 1 radius, 1 ulna, 1 coracoid, 1 scapula, 2 femora, 2 tibiotarsi, 1 tarsometatarsus, Yale Peabody Mus. nos. 533–536); *M. altus* considered a synonym.

Meleagris celer Marsh 1872 (October), Amer. Jour. Sci., ser. 3, vol. 4, no. 22, p. 261 (types from Manalapan, New Jersey, tibiotarsus and tarsometatarsus). *Meleagrops celer* (Marsh ms.), *Meleagris celer*.—Shufeldt 1913, Auk, vol. 30, no. 1, p. 29, pl. 3, figs. 3–5 (Marsh's type tarsometatarsus from Manalapan, Yale Peabody Mus.).

Ardea sellardsi Shufeldt 1917, Florida Geol. Surv., Ninth Annual Rept., p. 38, pl. 2, fig. 15 (type tibiotarsus from Vero Beach, Florida).—*Meleagris gallopavo*, Wetmore 1931a, Smithsonian Misc. Coll., vol. 85, no. 2, p. 33 (Shufeldt's type from Vero Beach, formerly Florida Geol. Surv. no. 7551, now in U.S. Nat. Mus.).

Meleagris tridens Wetmore 1931a (13 Apr.), Smithsonian Misc. Coll., vol. 85, no. 2, p. 33, fig. 13, pl. 6 (type from Seminole Field, Florida, tarsometatarsus, U.S. Nat. Mus. no. 12052).

Late Pleistocene (Rancholabrean) through Holocene: eastern, central, and southwestern United States, and parts of eastern and western México.

Meleagris californica (L. Miller 1909)

Pavo californicus L. Miller 1909 (14 Aug.), Univ. Calif. Publ., Bull. Dept. Geol., vol. 5, no. 19, p. 285, pl. 25 (type from Rancho La Brea, right tarsometatarsus, Univ. Calif. Mus. Paleo. no. 11300).—*Parapavo californicus*, L. Miller 1916a (10 March), Univ. Calif. Publ., Bull. Dept. Geol., vol. 9, no. 7, p. 96.

Meleagris richmondi Shufeldt 1915 (Feb.), Trans. Connecticut Acad. Arts Sci., vol. 19, p. 67, pl. 2, fig. 19 (type from Mission San Jose, California, fragmentary sternum, Yale Peabody Mus. no. 905).—*Parapavo californicus*, Brodkorb 1964a (26 June), Bull. Florida State Mus., vol. 8, no. 3, p. 326.

Late Pleistocene (Rancholabrean): asphalt pits, Rancho La Brea local fauna. California: Los Angeles County, Rancho La Brea (L. Miller 1909).

Meleagris ocellata Cuvier 1820

Meleagris ocellata Cuvier 1820, Mem. Mus. Hist. Nat., vol. 5, no. 1, p. 4, pl. 1 (type from Gulf of Honduras).—*Agriocharis ocellata*, Chapman 1896, Bull. Amer. Mus. Nat. Hist., vol. 8, p. 287.—*Eumeleagris ocellata*, Coues 1903, Key to North Amer. Birds, vol. 2, ed. 5, p. 727.

Holocene: Belize, northern Guatemala, eastern Chiapas, and eastern Tabasco through Campeche, Yucatán, and Quintana Roo, México.

Meleagris crassipes L. Miller 1940

Meleagris crassipes L. Miller 1940 (15 May), Condor, vol. 42, no. 3, p. 154, figs. 44–45 (type from San Josecito Cavern, tarsometatarsus, Calif. Inst. Techn. no. 2708, now in Nat. Hist. Mus. Los Angeles County).—*Agriocharis crassipes*, Brodkorb 1964b (4 Nov.), Quart. Jour. Florida Acad. Sci., vol. 27, no. 3, p. 225.

Late Pleistocene (Rancholabrean): cave deposit, San Josecito Cave local fauna. México: Nuevo León: San Josecito Cave, near Aramberri.

EVOLUTION

Rhegminornis calobates is morphologically unique among the species included in this study (Tables 3, 21). Its relationships to younger species are poorly understood, although there is a suggestion of relatively close affinities to *Proagriocharis kimballensis* (Table 3). The somewhat younger (Clarendonian?) tibiotarsus from Westmoreland Park, Virginia, is much too large for *R. calobates* and is also larger than *P. kimballensis*. Typically for a tibiotarsus, this specimen suffers a lack of

diagnostic characters that prevents further elucidation of its place in meleagridine phylogeny.

The relationships of *Proagriocharis kimballensis* to any of the younger turkeys are also quite uncertain. If a trend of increasing size with decreasing age occurred in late Hemphillian and early Blancan times, as it did from the late Blancan through the Rancholabrean in the *M. gallopavo* lineage, *P. kimballensis* could qualify as a possible ancestor of *M. progenes* on the basis of its size and age. But the low similarity between these two species (Table 2), although probably due at least in part to the sample sizes involved, does not give strong support for such a lineage. Sadly, other Hemphillian turkey fossils, all larger than *P. kimballensis*, are represented only by tibiotarsi from Bone Valley, Florida, and Buckhorn, New Mexico. These previously unreported fossils, both of which are tentatively referred to *Meleagris*, and the Upper Miocene (Clarendonian?) tibiotarsus from Virginia, suggest that *Proagriocharis* and perhaps *Rhegminornis* represent a sibling group of the larger main line of turkeys.

Meleagris progenes is most similar to *M. leopoldi* and fossils from Inglis and Coleman (Table 2), suggesting that only one lineage is represented by these four populations, with *M. leopoldi* intermediate, both morphologically and temporally, between *M. progenes* and the Inglis-Coleman forms.

The turkeys from Inglis and Coleman are very closely related and certainly represent only one lineage. The qualitative characters of the Vallecito Creek specimen (*M. anza*) are within the range of variation of Inglis specimens. All humeral characters that supposedly distinguish the Vallecito Creek turkey from Inglis turkeys are either definitely or quite possibly due to the crushing of the Vallecito Creek fossil, hence the tentative referral of the Inglis specimens to this species. Extending the range of a species of fossil turkey from California to Florida is not unreasonable in light of the present distribution and varied choice of habitat of *M. gallopavo*. The paleoecological evidence (Downs and White 1968; Hibbard 1970; Hibbard and Dalquest 1966; Howard 1963; Klein 1971; Martin 1974) suggests fairly similar habitats for these Irvingtonian sites, further increasing the likelihood of a single, wide-ranging species or an osteologically similar superspecies of turkey existing during the early and middle Irvingtonian. In this regard, however, I must say that turkeys are very limited in their utility as paleoecological indicators. Aside from needing trees in which to roost, it is quite difficult to generalize about the habitat of *M. gallopavo*, discussions of which are found in Hewitt (1967), Leopold (1948), and Schorger (1966); see also Leopold (1948), and Steadman et al. (1979), for habitat requirements of *M. ocellata*. The use of *M. ("Agriocharis") anza* by Hibbard and Dalquest (1966) to suggest environmental conditions in the early Pleistocene of north-central Texas as being perhaps similar to those of the modern Yucatán peninsula is particularly inappropriate, not only because of the above mentioned vagueness in the definition of turkey habitat, but also because the femur from Gilliland, Texas, which Brodkorb (1964b) referred to *M. ("Agriocharis") anza*, is not even safely identifiable to genus (see discussion of Gilliland in Systematics section).

No turkey fossils older than Rancholabrean are even tentatively referable to *M. gallopavo*, although the Coleman specimens, when compared to earlier forms, are definitely approaching the *M. gallopavo* grade and are clearly intermediate between specimens from Inglis and *M. gallopavo*. There is

little doubt that *M. gallopavo* evolved from the Coleman-type turkey. How much of the present range of *M. gallopavo* was occupied by this form in late Irvingtonian times is not known. Perhaps the *M. gallopavo* grade was attained initially in only a small portion of this present range. This contradicts the following statement of Hibbard and Dalquest (1966:14), "It appears that these southern members [*M. progenes*, *M. leopoldi*, and *M. anza*; at the time thought to be more closely related to *M. ocellata* than to *M. gallopavo*] were slowly displaced southward by the progressively cooler climates produced by each successive glaciation. The more northern turkey, *Meleagris gallopavo*, was able to extend its range southward with the development of the strong continentality of the climate during Wisconsin time." This statement implies that the earlier forms ("southern members") were dead-end taxa that existed contemporaneously with *M. gallopavo*. It is a basic thesis of my studies, however, that these Blancan and Irvingtonian turkeys are not drastically different from the living *M. gallopavo* and, in fact, probably represent its direct ancestors.

Holman (1964) noted that the pneumatic foramen on the dorsal base of the shaft of the scapula distinguishes living Meleagridinae from other gallinaceous birds. As noted in the Comparative Osteology section, *Meleagris progenes* of Rexroad (Blancan) and *Meleagris* cf. *M. leopoldi* or *M. anza* from Inglis IA (earliest Irvingtonian) lack this foramen, which is present in the late Irvingtonian species of *Meleagris* from Haile XVIA and Coleman IIA, as well as *M. californica* (Rancholabrean), and the living *M. gallopavo* and *M. ocellata*. All species of Phasianinae that I have examined lack this foramen except *Pavo cristatus* and *P. muticus*. Increased pneumaticity of the scapula may be related to increased size, as *Pavo* and *M. gallopavo* are the largest phasianines and meleagridines, respectively, and *Meleagris* sp. of Coleman is larger than *M. progenes* or the Inglis specimens. The foramen in *Pavo* is between the glenoid facet and the furcular articulation, but, in meleagridines, the foramen lies more posteriorly on the base of the shaft, away from articulating surfaces. This difference in position, combined with documentation from fossils from Rexroad, Inglis, Haile XVIA, and Coleman on the development of this foramen during Irvingtonian times, and the lack of a foramen in all Phasianinae but *Pavo*, suggests that a non-foraminate scapula is the primitive condition in both the Phasianinae and Meleagridinae, and the foraminate scapula is the derived state. The presence of a pneumatic foramen in *M. gallopavo*, *M. ocellata*, and *M. californica* thus strongly argues for their common ancestry in the middle Irvingtonian. Both *M. ocellata* and *M. californica* are smaller than Inglis specimens. If they branched off from the Inglis-Coleman lineage before reaching the foraminate condition, the foramen may not have been expected to evolve in these species. Therefore, *M. gallopavo*, *M. ocellata* and *M. californica* are probably derived from isolated populations of a Coleman-like turkey, after the development of the foraminate scapula. This is further supported by these three forms each being more similar to specimens from Coleman than to those from Inglis (Table 2). The ancestors of *M. californica* and *M. ocellata* in the late Irvingtonian were not necessarily identical to the Coleman turkey, because as much variation probably occurred in this widespread species or superspecies as occurs in *M. gallopavo* today (compare tarsometatarsal measurements and ratios of *M. g. silvestris* and *M. g. osceola* in Tables 20 and 22).

Meleagris ocellata, which has no fossil record in the Pleistocene, may have evolved from a population of turkeys similar to those of Coleman that became isolated in the Yucatán region by a high stand of the sea during an interglacial period in middle to late Irvingtonian times. No turkeys live today in the very wet coastal lowlands of western Tabasco to central Veracruz, México. Thus it appears that this wet tropical forest forms a barrier between present populations of *M. ocellata* in the Yucatán region and *M. gallopavo intermedia* in coastal northern Veracruz and Tamaulipas. This barrier probably did not exist continuously in the Pleistocene, as documented by Martin (1974), who found strong western and neotropical affinities in the Coleman mammals, many of which probably entered Florida via a Gulf Coast savanna corridor. This implies somewhat more xeric conditions than at present, increasing the likelihood that turkeys were living in even the wettest portions of the Gulf Coast. Thus, it is likely that the Coleman-type turkey occurred around the entire Gulf Coast area when the "savanna corridor" existed. The distance involved would not be great, as a drop in sea level of 100 meters during a glacial period would have decreased the land distance from Tampa, Florida, to Mérida, Yucatán, from about 3600 to about 2400 kilometers (Webb 1974).

Meleagris californica undoubtedly evolved from populations that became isolated in California, where turkeys are known to occur as early as the Hemphillian or Blancan (University Drive site). The high degree of similarity between *M. californica* and *M. gallopavo* suggests either that these two species were subject to fairly similar selective forces after populations of their common ancestors became isolated, or that the ancestors of *M. californica* became isolated in California only after reaching the *M. gallopavo* grade. *Meleagris gallopavo* is not known west of central Arizona today. The quite arid conditions in western Arizona and southeastern California that prevail today could easily have provided a barrier to gene flow between the turkeys of southwestern California and southeastern Arizona.

The relationships of *M. crassipes* to other turkeys is difficult to assess at this point. It is the smallest of the various species of *Meleagris* and is perhaps best characterized by its rather distinctive tarsometatarsus. It resembles *M. californica* more than other congeners (Tables 2 and 3), but it also has a fair degree of qualitative and quantitative similarity to *M. progenes*, a form known only from Kansas and Arizona. A more complete discussion of *M. crassipes* is found in Amadeo Rea's paper in this volume.

The idea of a phasianine origin of the Meleagridinae is supported by the phasianine nature of the furcula (characters 3, 5, 9), scapula (character 3), and tarsometatarsus (characters 4, 6, 7) in the first meleagridines in which these elements are known, as well as general osteological similarity. Therefore, I propose that turkeys originated from a phasianine stock that either (1) became isolated in the New World and evolved *in situ* or (2) invaded the New World after reaching the meleagridine grade in the Old World. The presence of the above mentioned phasianine characters in various turkeys favors the first hypothesis, as does the lack of recognized meleagridine fossils in the Old World. If one considers turkeys as having come to North America via a land corridor over the Bering Strait, then they would have dispersed through North America from west to east, rather than vice versa. Details of this dis-

persal cannot be presently defined. However, the apparent turkey from the late Miocene of Virginia and *Rhegminornis* from the early Miocene of Florida suggest the potential for Miocene and perhaps earlier turkey-like fossils from central and western North America. A plausible alternative to the Bering Strait dispersal route is that of an early Tertiary route from western Europe to eastern North America. Available fossil evidence favors neither hypothesis.

ACKNOWLEDGMENTS

It is with great pleasure that I dedicate this paper to Pierce Brodkorb for his supervision during early phases of this study, and to Hildegard Howard in recognition of her innumerable contributions in avian paleontology, especially her monograph in 1927 of *Meleagris californica*, which still remains the most useful single reference on the osteology of turkeys.

Kenneth E. Campbell, David W. Johnston, and S. David Webb critically reviewed my Masters Thesis at the University of Florida, upon which much of this paper is based. Storrs L. Olson and Amadeo M. Rea read and commented on the manuscript. Discussion and correspondence with Michael K. Frazier, David D. Gillette, Jean-Georges Klein, H. Gregory McDonald, Thomas R. Van Devender, S. David Webb, and Elizabeth S. Wing have helped to answer many paleontological questions, and discourse with Stephen W. Eaton and Lovett E. Williams, Jr., has enriched by knowledge of living turkeys. Working with Amadeo M. Rea, whose complementary study appears in this volume, has been most productive. Kenneth E. Campbell, Alison Habel, Charles Krantz, and Victor E. Krantz helped with the photographs, and Thomas Ritchie aided with the illustrations.

I also thank John Anderson, Edward Steadman, and Theresa Steadman for aid in calculations, and Deborah Gaines for her courageous typing efforts. Partial financial support was provided by teaching assistantships from the Department of Zoology of the University of Florida, and the Josselyn Van Tyne Memorial Fund of the American Ornithologists' Union through James King. For working space and other resources during preparation of this manuscript, I thank the Division of Birds and the Division of Vertebrate Paleontology of the National Museum of Natural History, Smithsonian Institution, and the Laboratory of Paleoenvironmental Studies of the Department of Geosciences, University of Arizona. This is contribution number 842 of the Department of Geosciences, University of Arizona.

I am especially grateful to my parents, Norman and Theresa Steadman, and to my revered friend and colleague, Storrs L. Olson, whose constant encouragement have made this study possible.

Listed below are abbreviations of collections from which specimens were studied, followed by the names of persons who kindly made them available. All of these people have my sincere gratitude.

- AMNH American Museum of Natural History (Charlotte Holton, Malcolm McKenna).
- ANSP Academy of Natural Sciences of Philadelphia (David Gillette, Storrs Olson).
- CM Carnegie Museum of Natural History (John Guilday, Mary Dawson, Wendy Pollock, Mary Clench, Kenneth Parkes, Miriam Stern).

- F:AM Frick Collection, American Museum of Natural History (Malcolm McKenna).
- GW Glen Woolfenden.
- ISUM Idaho State University Museum (H. Gregory McDonald, John White).
- LACM Natural History Museum of Los Angeles County (Robert McKenzie, David Whistler).
- MCZ Museum of Comparative Zoology, Harvard University (Raymond Paynter).
- PB Pierce Brodkorb.
- PPHM Panhandle Plains Historical Museum (James Hanson, Gerald Schultz, Jackie Wilson).
- PU Princeton University, Museum of Natural History (Donald Baird).
- SBU Saint Bonaventure University, Department of Biology (Stephen Eaton).
- TMM Texas Memorial Museum, University of Texas (Janette Bannan, Ernest Lundelius).
- TTU Texas Tech University.
- UCMP University of California, Berkeley, Museum of Paleontology (J. Howard Hutchison).
- UCMVZ University of California, Berkeley, Museum of Vertebrate Zoology (Ned Johnson, Victoria Dziadosz, National Science Foundation Grant BMS 2700102).
- UF University of Florida, Florida State Museum (S. David Webb, Chandra Aulsbrook).
- UFZA University of Florida, Florida State Museum Zooarchaeological Collection (Elizabeth S. Wing).
- UK University of Kansas, Museum of Natural History (Marion Mengel).
- UMMP University of Michigan, Museum of Paleontology (Claude Hibbard).
- UNSM University of Nebraska State Museum (C. Bertrand Schultz).
- USNM United States National Museum of Natural History (John Barber, Storrs Olson, Robert Purdy, Clayton Ray).
- WWR Welder Wildlife Refuge (W. Caleb Glazener).
- YPM Yale University, Peabody Museum.

LITERATURE CITED

- BRODKORB, P. 1957. New passerine birds from the Pleistocene of Reddick, Florida. *Jour. Paleontol.* 21(1):129-138.
- . 1959. The Pleistocene avifauna of Arredondo, Florida. *Bull. Florida State Mus., Biol. Sci.* 4(9):269-291.
- . 1963. A giant flightless bird from the Pleistocene of Florida. *Auk* 80(2):111-115.
- . 1964a. Catalogue of fossil birds: Part 2 (Anseriformes through Galliformes). *Bull. Florida State Mus., Biol. Sci.* 8(3):195-335.
- . 1964b. Notes on fossil turkeys. *Quart. Jour. Florida Acad. Sci.* 27(3):223-229.
- . 1967. Catalogue of fossil birds: Part 3 (Ralliformes, Ichthyornithiformes, Charadriiformes). *Bull. Florida State Mus., Biol. Sci.* 11(3):99-220.
- CAMPBELL, K.E. 1976. An early Pleistocene avifauna from Haile XVA, Florida. *Wilson Bull.* 88(2):345-347.
- . 1980. A review of the Rancholabrean Avifauna of the Itchtucknee River, Florida. (this vol.).
- CHAPMAN, F.M. 1896. Notes on birds observed in Yucatán. *Bull. Amer. Mus. Nat. Hist.* 8(18):271-290.
- COPE, E.D. 1871. Synopsis of the extinct Batrachia, Reptilia and Aves of North America. *Trans. Amer. Phil. Soc.* 14:1-252.
- COUES, E. 1903. Key to North American Birds, 5th ed. Vol. 2. Pp. 537-1152. Dana Estes and Co., Boston.
- CRACRAFT, J. 1968. First record of the turkey *Meleagris gallopavo* from the Pleistocene of Mexico. *Condor* 70(3):274.
- CUVIER, G. 1820. *Mem. Mus. Hist. Nat.* 6:1, 4.
- DOWNS, T., AND J.A. WHITE. 1968. A vertebrate faunal succession in superposed sediments from late Pliocene to middle Pleistocene in California. *Proc. Internat. Geol. Cong.* 10:41-47.
- EATON, S.W., AND T.L. MOORE. 1965-66. Age and sexual variation in the skeleton of the wild turkey. *Sci. Studies St. Bonaventure Univ.* 23:25-40.
- FEDUCCIA, A. 1973. Fossil birds from the Late Pleistocene Ingleside Fauna, San Patricio County, Texas. *Condor* 75(2):243-244.
- GRAY, G.R. 1840. A List of the Genera of Birds with an Indication of the Typical Species of Each Genus Compiled from Various Sources. London. 80 pp.
- HAMON, J.H. 1964. Osteology and Paleontology of the passerine birds of the Reddick, Florida, Pleistocene. *Florida Geol. Surv. Geol. Bull.* 44. 210 pp.
- HEWITT, O.H., ED. 1967. The Wild Turkey and Its Management. The Wildlife Society, Washington, D.C. 589 pp.
- HIBBARD, C.W. 1960. An interpretation of Pliocene and Pleistocene climates of North America. *Rept. Michigan Acad. Arts, Sci., Letters for 1959-60*:5-30.
- . 1970. Pleistocene mammalian local faunas from the great plains and central lowland provinces of the United States. Pp. 395-433 in *Pleistocene and Recent environments of the central great plains* (W. Dort, Jr. and J.K. Jones, Eds.) *Dept. Geol. Univ. Kansas Spec. Publ.* 3. 433 pp.
- HIBBARD, C.W., C.E. RAY, D.E. SAVAGE, D.W. TAYLOR, AND J.E. GUILDAY. 1965. Quaternary mammals of North America. Pp. 509-525 in *The Quaternary of the United States* (H.E. Wright and D.G. Frey, Ed.). Princeton Univ. Press, Princeton.
- HIBBARD, C.W., AND W.W. DALQUEST. 1966. Fossils from the Seymour Formation of Knox and Baylor Counties, Texas, and their bearing on the late Kansan climate of that region. *Univ. Michigan, Contr. Mus. Paleontol.* 21(1):1-66.
- . 1973. *Proneofiber*, a new genus of vole (Cricetidae: Rodentia) from the Pleistocene Seymour Formation of Texas, and its evolutionary and stratigraphic significance. *Jour. Quat. Res.* 3(2):269-274.
- HIRSCHFELD, S.E. 1968. Vertebrate fauna of Nichol's Hammock, a natural trap. *Quart. Jour. Florida Acad. Sci.* 31(3):177-189.
- HOLLAND, W.J. 1908. A preliminary account of the Pleistocene fauna discovered in a cave opened at Frankstown, Pennsylvania, in April and May, 1907. *Ann. Carnegie Mus.* 4(3-4):228-233.
- . 1912. A preliminary account of the Pleistocene fauna discovered in a cave opened at Frankstown, Pennsylvania, in April and May, 1907. *Proc. 7th Internat. Zool. Cong., Boston, 19-24 August, 1907*:748-752.

- HOLMAN, J.A. 1959. Birds and mammals from the Pleistocene of Williston, Florida. *Bull. Florida State Mus., Biol. Sci.* 5(1):1-24.
- . 1964. Osteology of gallinaceous birds. *Quart. Jour. Florida Acad. Sci.* 27(3):230-252.
- HOPKINS, M.L., R. BONNICHSEN, AND D. FORTSCH. 1969. The stratigraphic position and faunal associates of *Bison (Gigantobison) latifrons* in southeastern Idaho, a progress report. *Tebiwa* 12(1):1-8.
- HOWARD, H. 1927. A review of the fossil bird, *Parapavo californicus* (Miller), from the Pleistocene asphalt beds of Rancho La Brea. *Univ. California Publ., Bull. Dept. Geol. Sci.* 17(1):1-56.
- . 1928. The beak of *Parapavo californicus* (Miller). *Southern California Acad. Sci. Bull.* 27(3):90-91.
- . 1936. A new record for *Parapavo californicus* (Miller). *Condor* 38(6):249-250.
- . 1962. Bird remains from a prehistoric cave deposit in Grant County, New Mexico. *Condor* 64(3):241-242.
- . 1963. Fossil birds from the Anza-Borrego Desert. *Los Angeles Co. Mus. Contrib. Sci. No.* 73:1-33.
- JOHNSTON, C.S., AND D.E. SAVAGE. 1955. A survey of various late Cenozoic vertebrate faunas of the Panhandle of Texas. Part I. *Univ. California Publ. Geol. Sci.* 31(2):27-50.
- KLEIN, J.G. 1971. The ferungulates of the Inglis IA local fauna, Early Pleistocene of Florida. M.S. Thesis, Univ. Florida, Gainesville. 115 pp.
- KOOLITH, M.R.M. 1975. The 17th century wild turkey in Kanawha River Valley. M.S. Thesis, St. Bonaventure Univ. 72 pp.
- LEIDY, J. 1889. Notice and description of fossils in caves and crevices of the limestone rocks of Pennsylvania. *Geol. Surv. Pennsylvania Ann. Rep.* pp. 1-21.
- LEOPOLD, A.S. 1948. The wild turkeys of Mexico. *Trans. XIII North Amer. Wildlife Conf.*:393-400.
- LINDSAY, E.H., N.M. JOHNSON, AND N.D. OPDYKE. 1975. Preliminary correlation of North American land mammal ages and geomagnetic chronology. Pp. 111-119 in *Studies on Cenozoic paleontology and stratigraphy*, Claude W. Hibbard Mem. Vol. 3 (G.R. Smith and N.E. Friedland, Eds.). *Univ. Michigan, Mus. Paleontol., Papers on Paleontol.* No. 12.
- LINNAEUS, C. 1758. *Systema Naturae*, ed. 10, Vol. 1. 824 pp.
- MARSH, O.C. 1870a. [Remains of a fossil turkey from New Jersey]. *Proc. Acad. Nat. Sci. Philadelphia* 22:11.
- . 1870b. New fossil turkey. *Amer. Naturalist* 4(5):317.
- . 1872. Notice of some new Tertiary and Post-Tertiary birds. *Amer. Jour. Sci.* 4(22):256-262.
- MARTIN, L.D., AND J. TATE. 1970. A new turkey from the Pliocene of Nebraska. *Wilson Bull.* 82(2):214-218.
- MARTIN, R.A. 1974. Fossil mammals from the Coleman IIA fauna, Sumter County. Pp. 35-99 in *Pleistocene Mammals of Florida* (S.D. Webb, Ed.). *Univ. Florida Press Gainesville*.
- MCCOY, J.J. 1963. The fossil avifauna of Itchtucknee River, Florida. *Auk* 80(3):335-351.
- MERCER, H.C. 1899. The bone cave at Port Kennedy, Pennsylvania, and its partial excavation in 1894, 1895, and 1896. *Jour. Acad. Nat. Sci. Philadelphia* 11(2):269-286.
- MILLER, A.H., AND R. BOWMAN. 1956. Fossil birds of the Late Pliocene of Cita Canyon, Texas. *Wilson Bull.* 68(1):38-46.
- MILLER, L.H. 1909. *Pavo californicus*, a fossil peacock from the Quaternary asphalt beds of Rancho La Brea. *Univ. California Publ., Bull. Dept. Geol.* 5(19):285-289.
- . 1911. Avifauna of the Pleistocene cave deposits of California. *Univ. California Publ., Bull. Dept. Geol.*, 6(16):385-400.
- . 1912. Contributions to avian paleontology from the Pacific Coast of North America. *Univ. California Publ., Bull. Dept. Geol.* 7(5):61-115.
- . 1916a. A review of the species *Pavo californicus*. *Univ. California Publ., Bull. Dept. Geol.* 9(7):89-96.
- . 1916b. Review of the Pleistocene species, *Pavo californicus*. (Abstract of paper given at Sixth Ann. Mtg. Pacific Coast Sect. Paleo. Soc., 27 Feb. 1915). *Bull. Geol. Soc. America* 27(1):171.
- . 1925. The birds of Rancho La Brea. *Carnegie Inst. Washington Publ.* 349:63-106.
- . 1927. The finding of Pleistocene material in an asphalt pit at Carpinteria, California: Bird remains. *Science* 66(1702):156.
- . 1940. A new Pleistocene turkey from Mexico. *Condor* 42(3):154-156.
- . 1942. A new fossil bird locality. *Condor* 44(6):283-284.
- . 1943. The Pleistocene birds of San Josecito Cavern, Mexico. *Univ. California Publ. Zool.* 47(5):143-168.
- MILLER, L.H., AND C.S. JOHNSTON. 1937. A Pliocene record of *Parapavo* from Texas. *Condor* 39(5):229.
- MILLER, W.E. 1971. Pleistocene vertebrates of the Los Angeles Basin and vicinity (exclusive of Rancho La Brea). *Bull. Los Angeles Co. Mus. Nat. Hist., Sci., No.* 10:1-124.
- NEILL, W.T., H.J. GUT, AND P. BRODKORB. 1956. Animal remains from four Preceramic sites in Florida. *Amer. Antiq.* 21(4):383-395.
- OLSON, S.L., AND J. FARRAND. 1974. *Rhegminornis* restudied: a tiny Miocene turkey. *Wilson Bull.* 86(2):114-120.
- OLSON, S.L., AND D.D. GILLETTE. 1978. Catalogue of type specimens of fossil vertebrates. *Academy of Natural Sciences, Philadelphia. Part III: Birds. Proc. Acad. Nat. Sci. Philadelphia* 129(7):99-100.
- OPDYKE, N.D., E.H. LINDSAY, N.M. JOHNSON, AND T. DOWNS. 1977. The paleomagnetism and magnetic polarity stratigraphy of the mammal-bearing section of Anza Borrego State Park, California. *Quat. Res.* 7:316-329.
- PATTEE, O.H., AND S.L. BEASOM. 1977. Rio Grande turkey hens with leg spurs. *Auk* 94(1):159.
- PATTON, T.H. 1969. Miocene and Pliocene artiodactyls, Texas Gulf Coastal Plain. *Bull. Florida State Mus., Biol. Sci.* 14(2):115-226.
- PAYNTER, R.A. 1955. The ornithogeography of the Yucatán Peninsula. *Peabody Mus. Nat. Hist. Yale Univ. Bull.* 9. 347 pp.
- PETERSON, O.A. 1926. The fossils of the Frankstown Cave, Blair Co., Pennsylvania. *Ann. Carnegie Mus.* 16(2):249-315.
- POLLOCK, H.E.D., AND C.E. RAY. 1957. Notes on vertebrate

- animal remains from Mayapan. Carnegie Inst. Washington, Dept. Archaeo., Curr. Reports No. 41:633-656.
- RAY, C.E. 1957. A list, bibliography and index of the fossil vertebrates of Florida. Florida Geol. Surv. Spec. Publ. No. 3:1-175.
- REA, A. 1980. Late Pleistocene and Holocene turkeys in the Southwest. (this vol.).
- RIDGWAY, R., AND H. FRIEDMANN. 1946. The birds of North and Middle America. Part X. U.S. Nat. Mus. Bull. 50:1-484.
- ROBERTSON, J.S., JR. 1976. Latest Pliocene mammals from Haile XV A, Alachua County, Florida. Bull. Florida State Mus. Biol. Sci. 20(3):111-186.
- SCHORGER, A.W. 1966. The Wild Turkey: Its History and Domestication. Univ. Oklahoma Press, Norman. 625 pp.
- SCHULTZ, C.B., AND E.B. HOWARD. 1935. The fauna of Burnet Cave, Guadalupe Mountains. New Mexico Proc. Acad. Nat. Sci. Philadelphia 87:273-298.
- SHUFELDT, R.W. 1897. On fossil bird-bones obtained by expeditions of the University of Pennsylvania from the bone caves of Tennessee. Amer. Naturalist 31:645-650.
- . 1913. Contributions to avian paleontology. Auk 30(1):29-39.
- . 1915. Fossil birds in the Marsh collection of Yale University. Trans. Connecticut Acad. Arts Sci. 19:1-110.
- . 1917. Fossil birds found at Vero, Florida, with descriptions of new species. Florida State Geol. Surv., IX Ann. Rept.:35-42.
- . 1918. Notes on some bird fossils from Florida. Auk 35(3):357-358.
- SKINNER, M.F. 1942. The fauna of Papago Springs Cave, Arizona, and a study of *Stockoceros*; with three new antilocaprine from Nebraska and Arizona. Bull. Amer. Mus. Nat. Hist. 80(6):143-220.
- STEADMAN, D.W. 1975. The Plio-Pleistocene evolution of turkeys (Aves: Meleagridinae). M.S. Thesis, Univ. Florida, Gainesville. 143 pp.
- STEADMAN, D.W., J. STULL, AND S.W. EATON. 1979. Natural History of the Ocellated Turkey. Jour. World Pheasant Assoc. 4:15-37.
- SUSHKIN, P.P. 1928. On the affinities of *Parapavo californicus* (Loye Miller). Ibis 12th Ser. 4(1):135-138.
- TEMMINCK, C.J. 1820. Manuel d'Ornithologie, ed. 2. Paris. 439 pp.
- VAN DEVENDER, T.R., AND R.D. WORTHINGTON. 1977. The herpetofauna of Howell's Ridge Cave and the paleoecology of the northwestern Chihuahuan Desert. Pp. 85-106 in Trans. Symp. Biol. Res. Chihuahuan Desert Region, U.S. and Mexico (R.H. Wauer and D.H. Riskind, Eds.). U.S. Dept. Int., Nat. Park Serv. Trans. and Proc. Series, No. 3.
- VIGORS, N.A. 1825. Observations on the natural affinities that connect the orders and families of birds. Trans. Linn. Soc. London 14(22):395-517.
- WEBB, S.D. 1974. Pleistocene Mammals of Florida. Univ. Florida Press, Gainesville. 270 pp.
- WETMORE, A. 1924. Fossil birds from southeastern Arizona. Proc. U.S. Nat. Mus. 64(5):1-18.
- . 1931a. The avifauna of the Pleistocene in Florida. Smithsonian Misc. Coll. 85(2):1-41.
- . 1931b. The fossil birds of North America. Pp. 401-472 in Check-list of North American Birds. 4th ed. American Ornith. Union, Lancaster, Pennsylvania.
- . 1943. Fossil birds from the Tertiary deposits of Florida. Proc. New England Zool. Club 22:59-68.
- . 1944. Remains of birds from the Rexroad fauna of the Upper Pliocene of Kansas. Univ. Kansas Sci. Bull. 30(9):89-105.
- . 1945. Record of the turkey from the Pleistocene of Indiana. Wilson Bull. 57(3):204.
- WHEATLEY, C.M. 1871a. Notice of the discovery of a cave in eastern Pennsylvania, containing remains of Post-Pliocene fossils, including those of Mastodon, Tapir, Megalonyx, Mylodon, etc. Amer. Jour. Sci. and Arts, ser. 3, 1(4):235-237.
- . 1871b. The Bone Cave of eastern Pennsylvania. American Jour. Sci. and Arts, ser. 3, 1:384-385.
- WILLIAMS, L.E. 1967. Wild turkeys (*Meleagris gallopavo*) with super-numerary leg spurs. Auk 84(1):113-114.
- WILLIAMS, L.E., AND D.H. AUSTIN. 1969. Leg spurs on female wild turkeys. Auk 86(3):561-562.
- WING, E.S., AND D.W. STEADMAN. In press. Faunal remains from the Dzibilchaltún site. In Excavations at Dzibilchaltún, Yucatán, Mexico, by E.W. Andrews IV and E.W. Andrews V, Publ. No. 48 of Mid. Amer. Res. Inst., Tulane Univ.
- WOOLFENDEN, G.E. 1959. A Pleistocene avifauna from Rock Spring, Florida. Wilson Bull. 71(2):183-187.

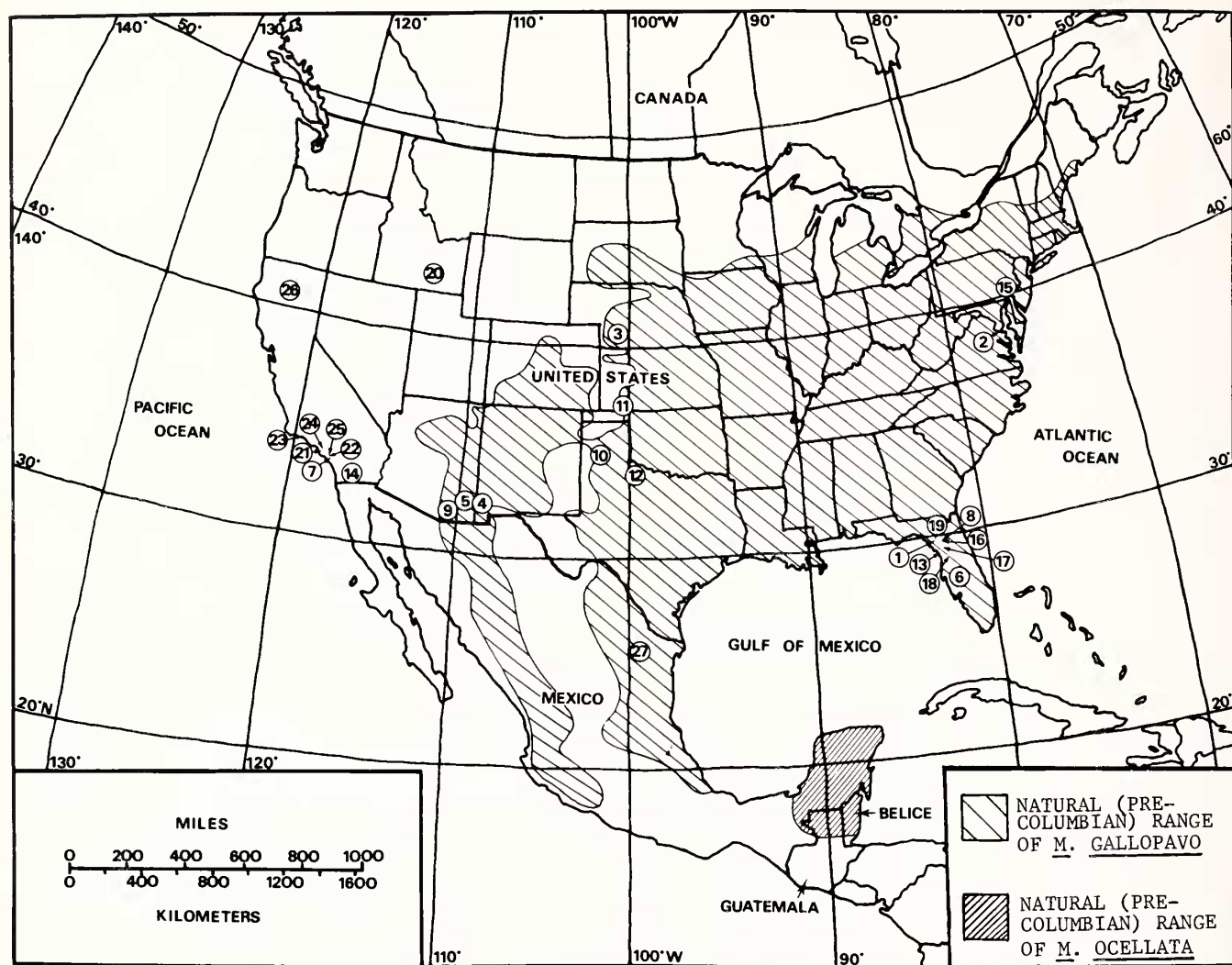


Figure 1. Distribution of fossil and living turkeys, omitting late Pleistocene (Rancholabrean) and Holocene records of *Meleagris gallopavo* and *M. ocellata* within their modern range. Numbers correspond with those in Table 1. Only sites from which specimens have been examined by the author are listed. See Rea (this vol.) for distribution of *M. crassipes*.

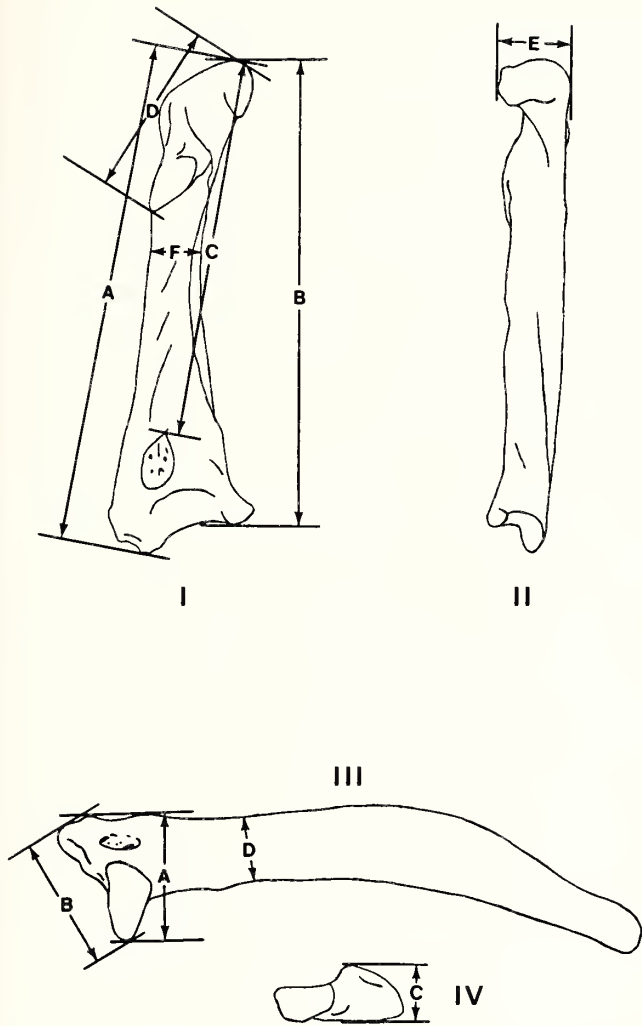


Figure 2. Measurements of the coracoid and scapula. I. Left coracoid, dorsal view: A—Head to external end of sternal facet; B—Head to internal distal angle; C—Head to pneumatic foramen; D—Head through scapular facet; F—Least width of shaft. II. Left coracoid, medial view: E—Depth of head. III. Left scapula, dorsal view: A—Proximal width; B—Tip of acromion to external tip of glenoid facet; D—Least width of neck. IV. Left scapula, proximal view: C—Depth of glenoid facet.

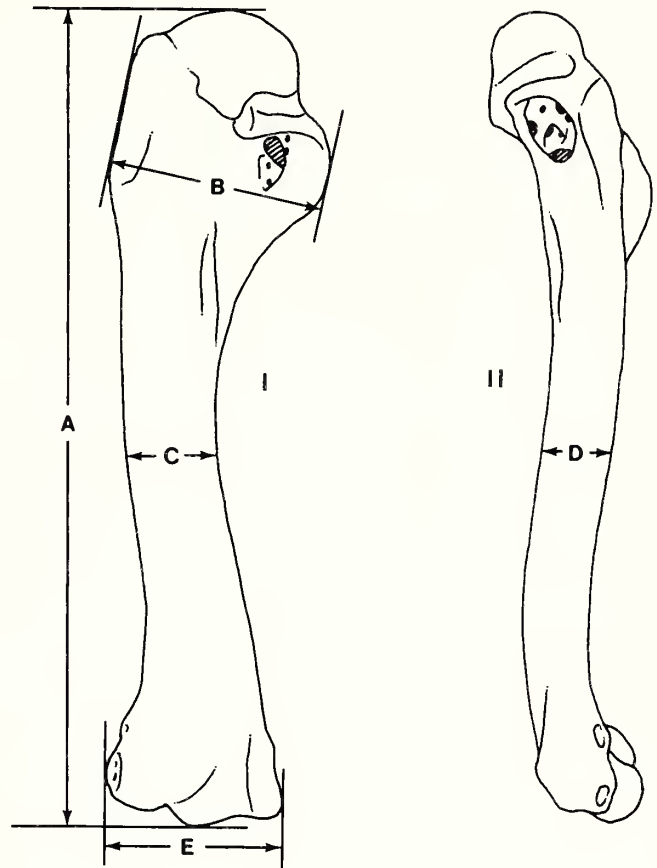


Figure 3. Measurements of the humerus. I. Left humerus, anconal view: A—Total length; B—Proximal width; C—Width of midshaft; E—Distal width. II. Left humerus, ventral view: D—Depth of midshaft.

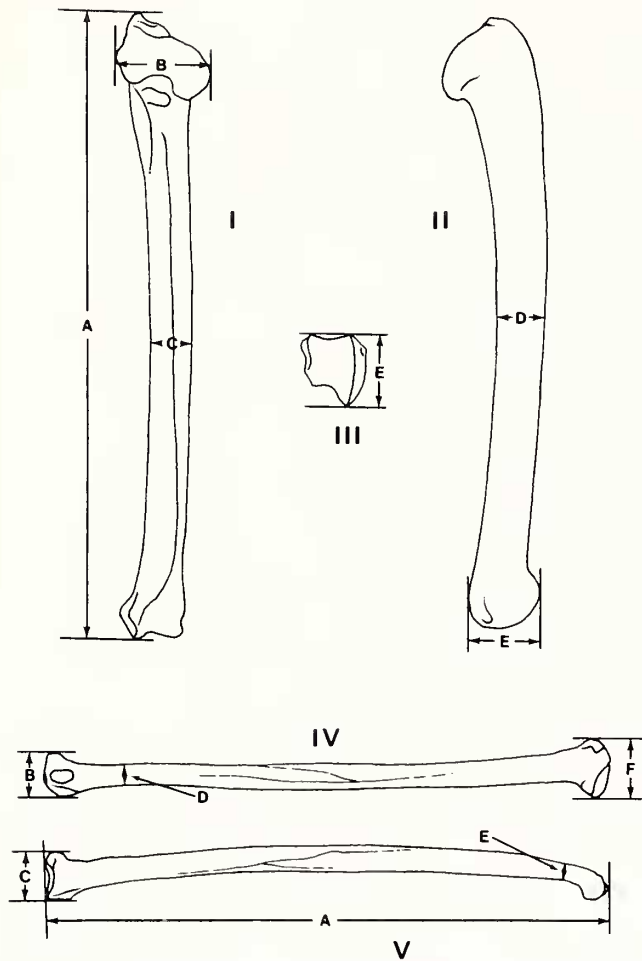


Figure 4. Measurements of the ulna and radius. I. Left ulna, palmar view: A—Total length; B—Proximal width; C—Width of midshaft. II. Left ulna, anconal view: D—Depth of midshaft; E—Distal depth. III. Left ulna, distal view: E—Distal depth. IV. Left radius, palmar view: B—Proximal width; D—Least width of shaft; F—Distal width. V. Left radius, medial view: A—Total length; C—Proximal depth; E—Least depth of shaft.

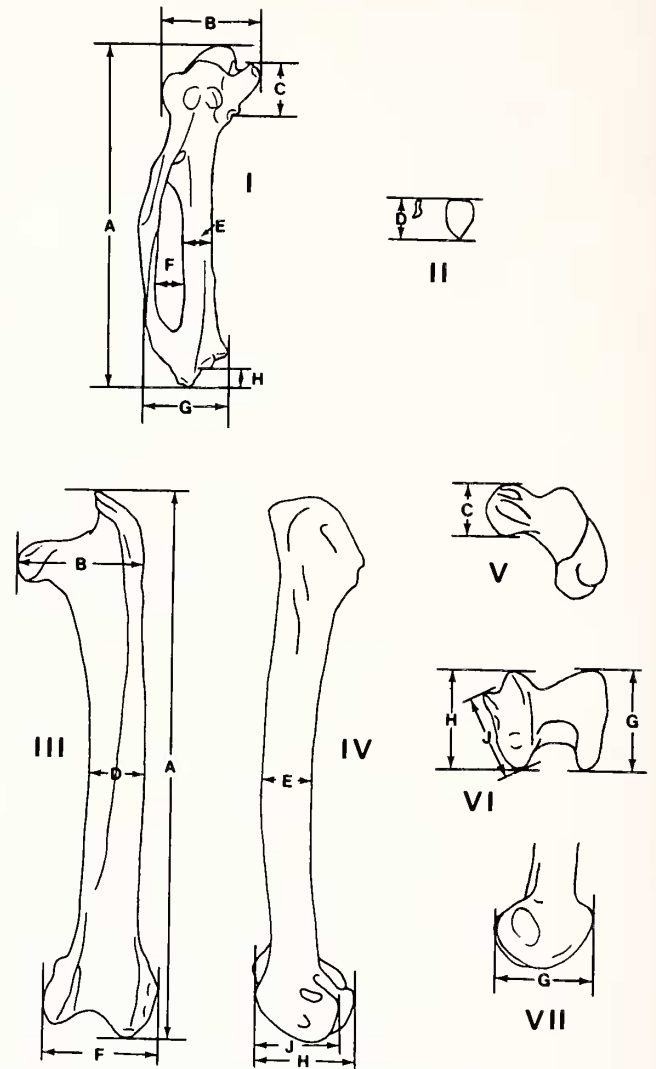


Figure 5. Measurements of the carpometacarpus and femur. I. Left carpometacarpus, internal view: A—Total length; B—Proximal depth; C—Length of metacarpal I; E—Least depth of metacarpal II; G—Distal depth; H—Protrusion of M III beyond knob of M II. II. Left carpometacarpus, cross section near center of metacarpal II: D—Least width of metacarpal II. III. Left femur, anterior view: A—Total length; B—Proximal width; D—Width of midshaft; F—Distal width. IV. Left femur, lateral view: E—Depth of midshaft; H—Depth of external condyle; J—Depth of fibular condyle. V. Left femur, proximal view: C—Depth of head. VI. Left femur, distal view: G—Depth of internal condyle; H—Depth of external condyle; J—Depth of fibular condyle. VII. Left femur, medial view: G—Depth of internal condyle.

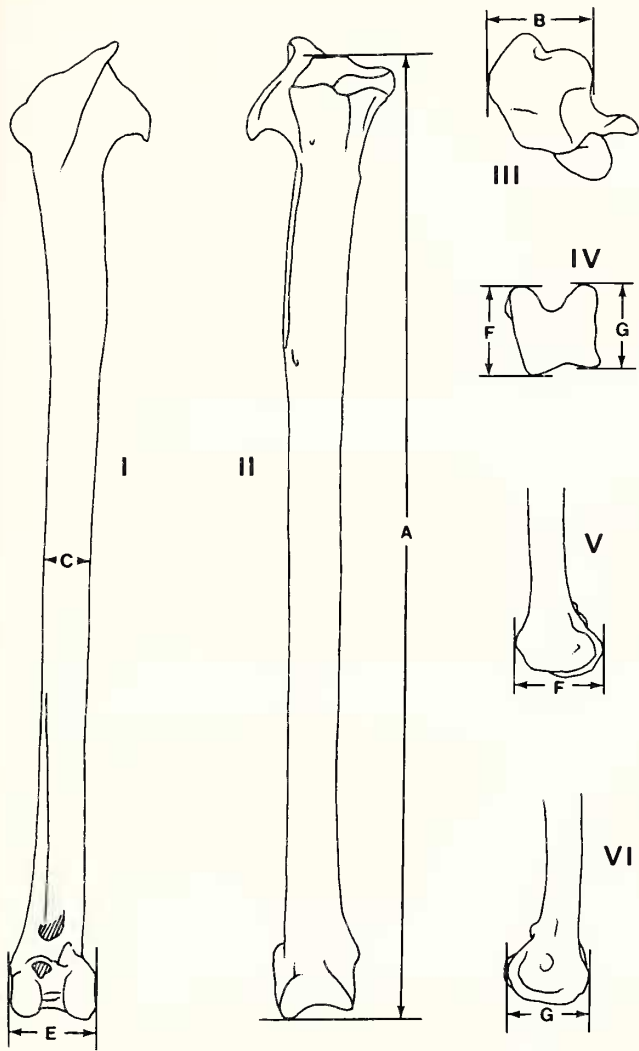


Figure 6. Measurements of the tibiotarsus. I. Left tibiotarsus, anterior view: C—Width of midshaft; E—Distal width. II. Left tibiotarsus, posterior view: A—Length without cnemial crest. III. Left tibiotarsus, proximal view: B—Width of head. IV. Left tibiotarsus, distal view: F—Depth of internal condyle; G—Depth of external condyle. V. Left tibiotarsus, medial view: F—Depth of internal condyle. VI. Left tibiotarsus, lateral view: G—Depth of external condyle.

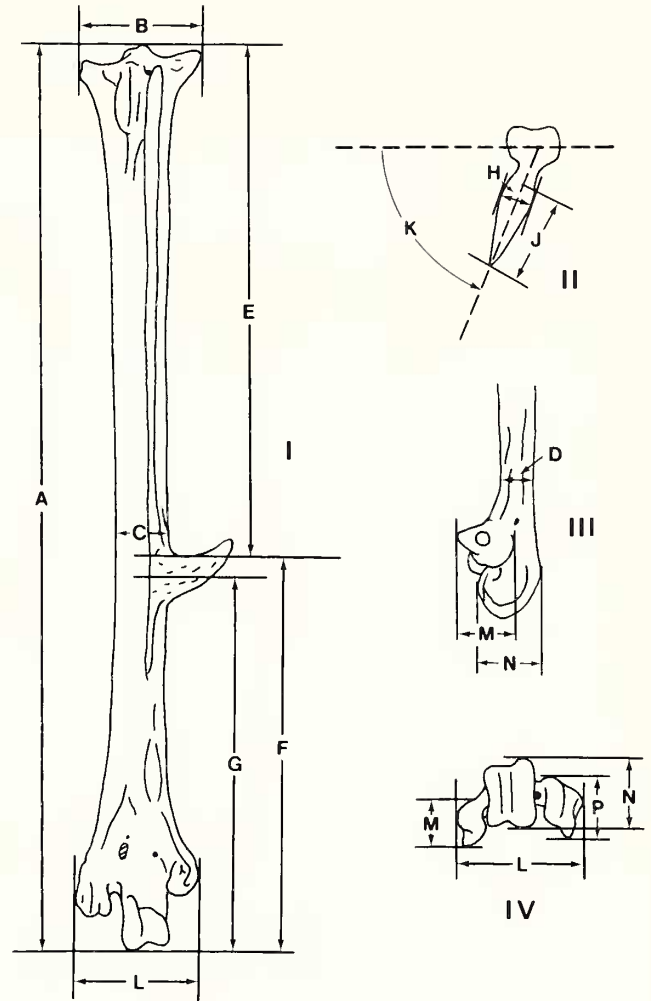


Figure 7. Measurements of the tarsometatarsus. I. Left tarsometatarsus, posterior view: A—Total length; B—Proximal width; C—Least width of shaft; E—Proximal end to middle of spur core; F—Top of spur core to end of middle trochlea; G—Middle of spur core to end of middle trochlea; L—Distal width. II. Right tarsometatarsus, cross section through spur core: H—Width of spur core; J—Length of spur core; K—Angle of spur core. III. Left tarsometatarsus, medial view: D—Least depth of shaft; M—Depth of inner trochlea; N—Depth of middle trochlea. IV. Left tarsometatarsus, distal view: L—Distal width; M—Depth of inner trochlea; N—Depth of middle trochlea; P—Depth of outer trochlea.

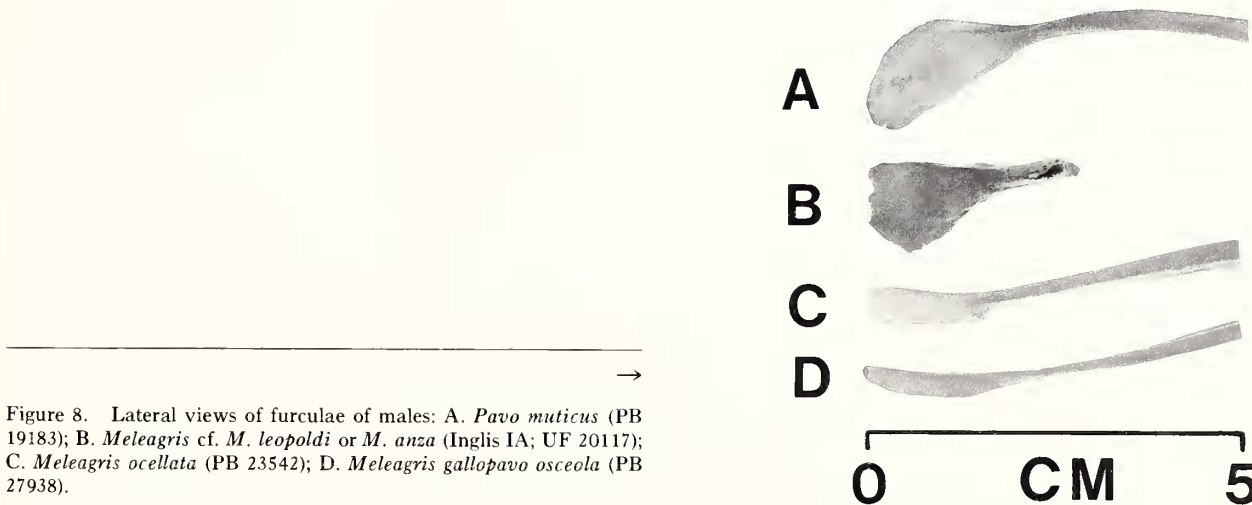


Figure 8. Lateral views of furculae of males: A. *Pavo muticus* (PB 19183); B. *Meleagris* cf. *M. leopoldi* or *M. anza* (Ingles IA; UF 20117); C. *Meleagris ocellata* (PB 23542); D. *Meleagris gallopavo osceola* (PB 27938).

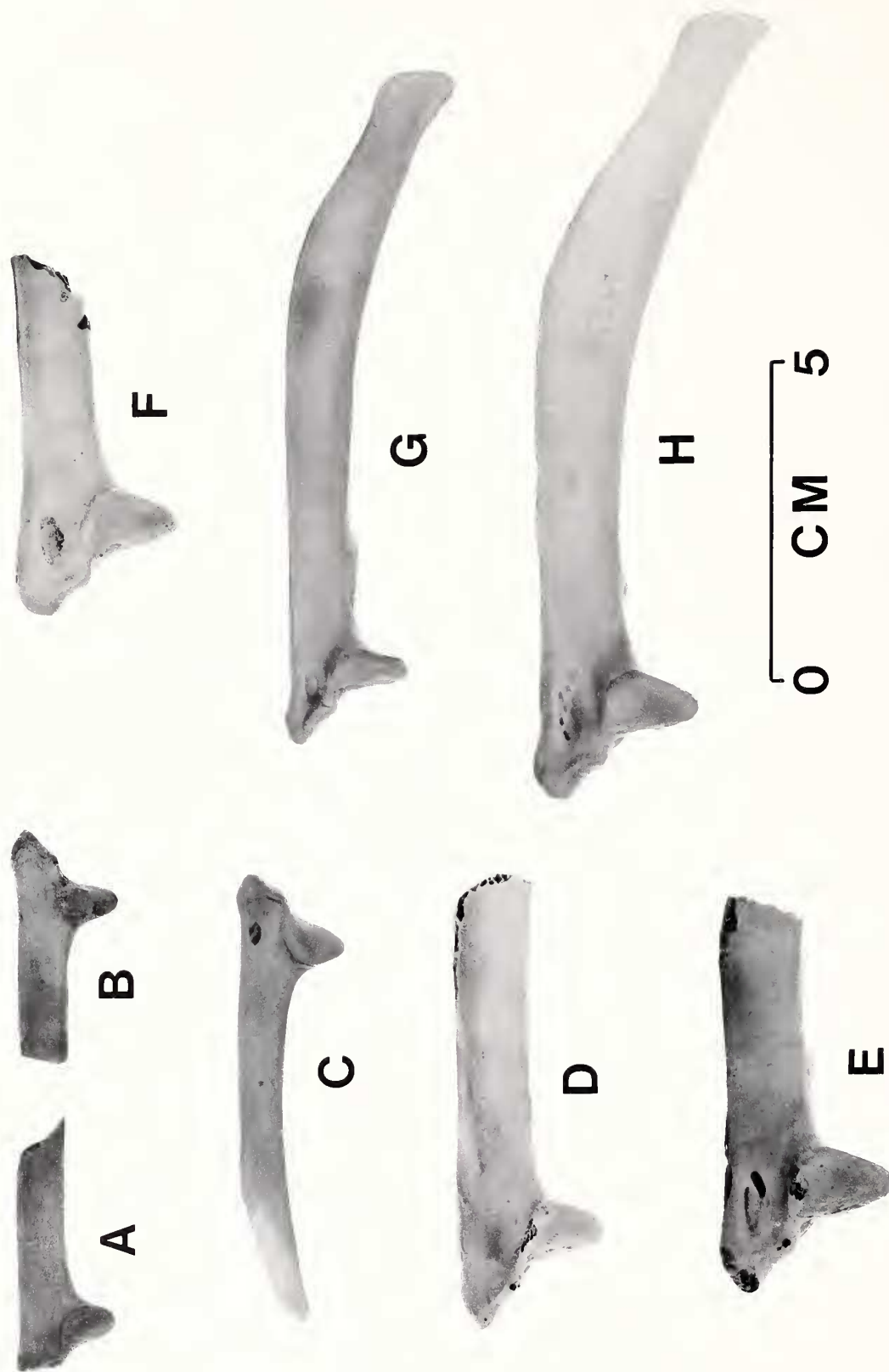


Figure 9. Dorsal views of scapulae of males: A. *Meleagris progenes* immature (Rexroad; UMMP 45965); B. *Meleagris* cf. *M. leopoldi* or *M. anza* immature (Ingles IA; UF 20208); C. *Meleagris gallopavo osceola* immature (PB 33763); D. *Meleagris* cf. *M. leopoldi* or *M. anza* adult (Ingles IA; UF 20196); E. *Meleagris* sp. adult (Coleman IIA; UF 11603C); F. *Meleagris californica* adult (Rancho La Brea; LACM E-7346); G. *Meleagris ocellata* adult (PB 23542); H. *Meleagris gallopavo osceola* adult (PB 27938).

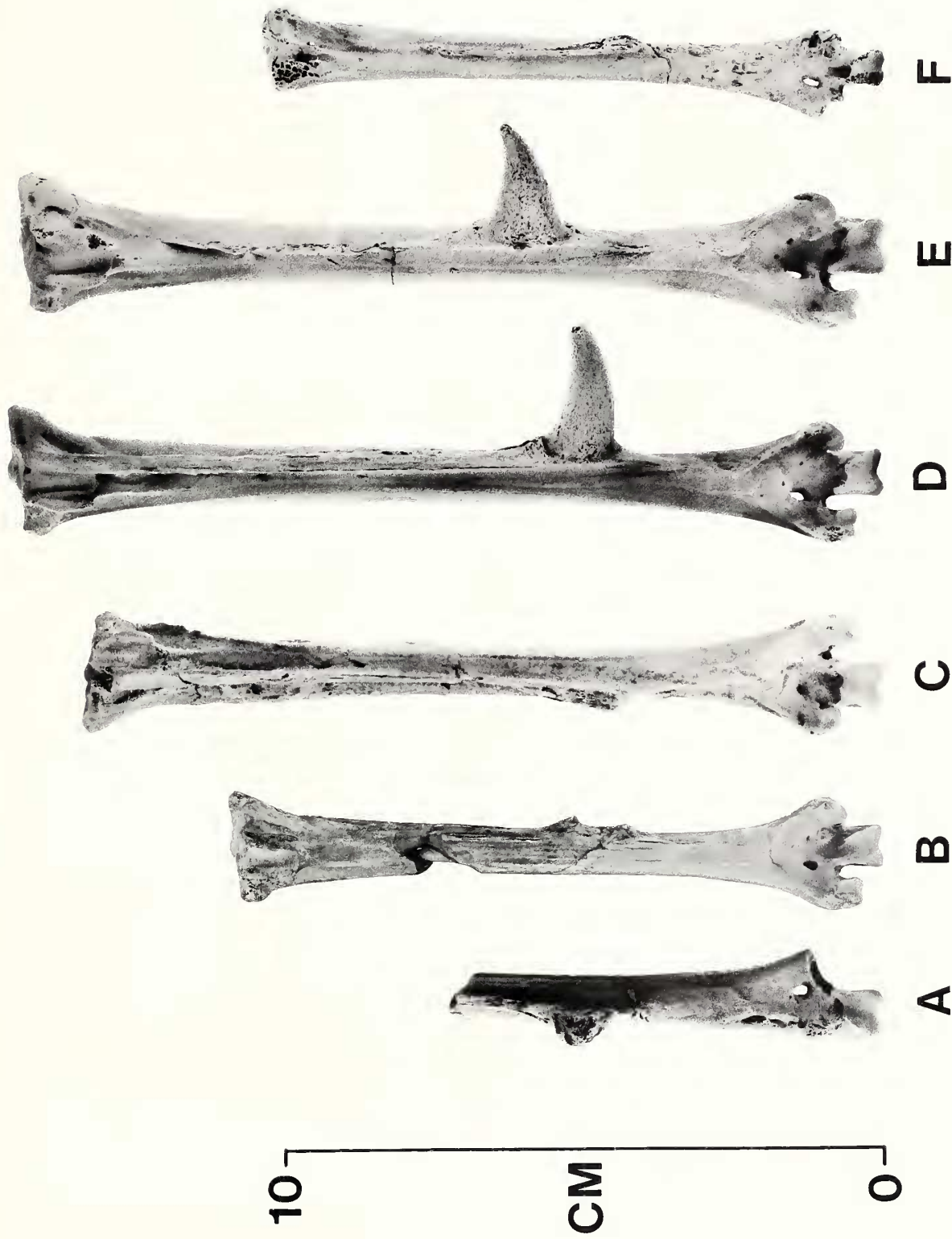


Figure 10. Posterior views of tarsometatarsi of males: A, B *Meleagris* cf. *M. progenes* (Benson; USNM 10551, AMNH 6330); C, *Meleagris leopoldi* (Cita Canyon; PPHM 3169); D, *Meleagris* cf. *M. leopoldi* or *M. anza* (Inglis IA; UF 20713); E, *Meleagris* sp. (Coleman IIA; UF 11601N); F, *Meleagris crassipes* (San Josecito Cave; LACM UC-100023).



Figure 11. Posterior views of tarsometatarsi of males: A, B. *Meleagris gallopavo osceola* (PB 33819, PB 23117); C. *Meleagris gallopavo silvestris* (USNM 501686); D. *Meleagris ocellata* (PB 23542).

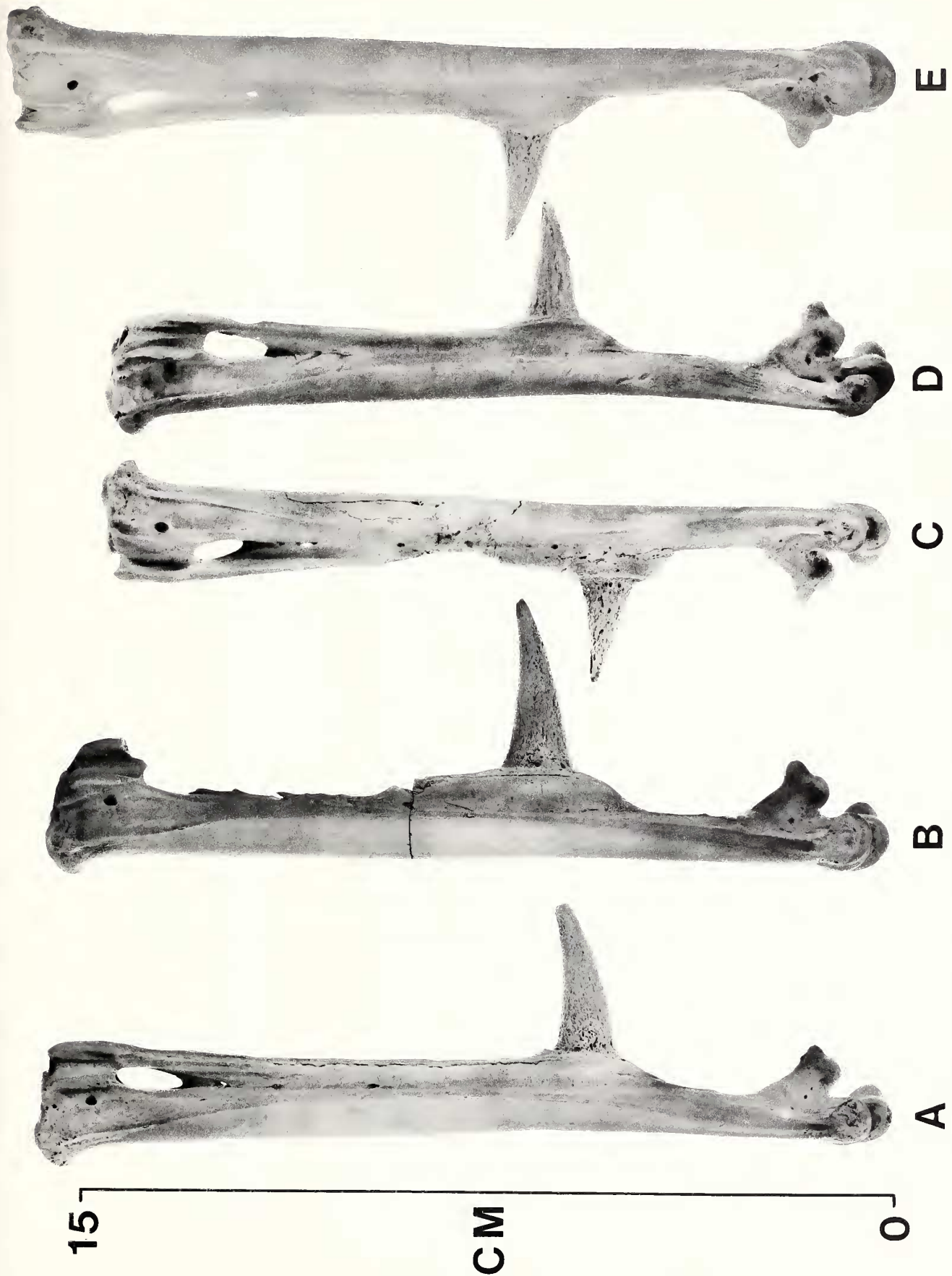


Figure 12. Lateral views of tarsometatarsi of males: A. *Meleagris* cf. *M. leopoldi* or *M. anza* (Inglis IA; UF 20713); B, C. *Meleagris* sp. (Coleman; UF 11601N, UF 11603C); D. *Meleagris californica* (Rancho La Brea; LACM E-5775); E. *Meleagris gallopavo sihestris* (USNM 501686).

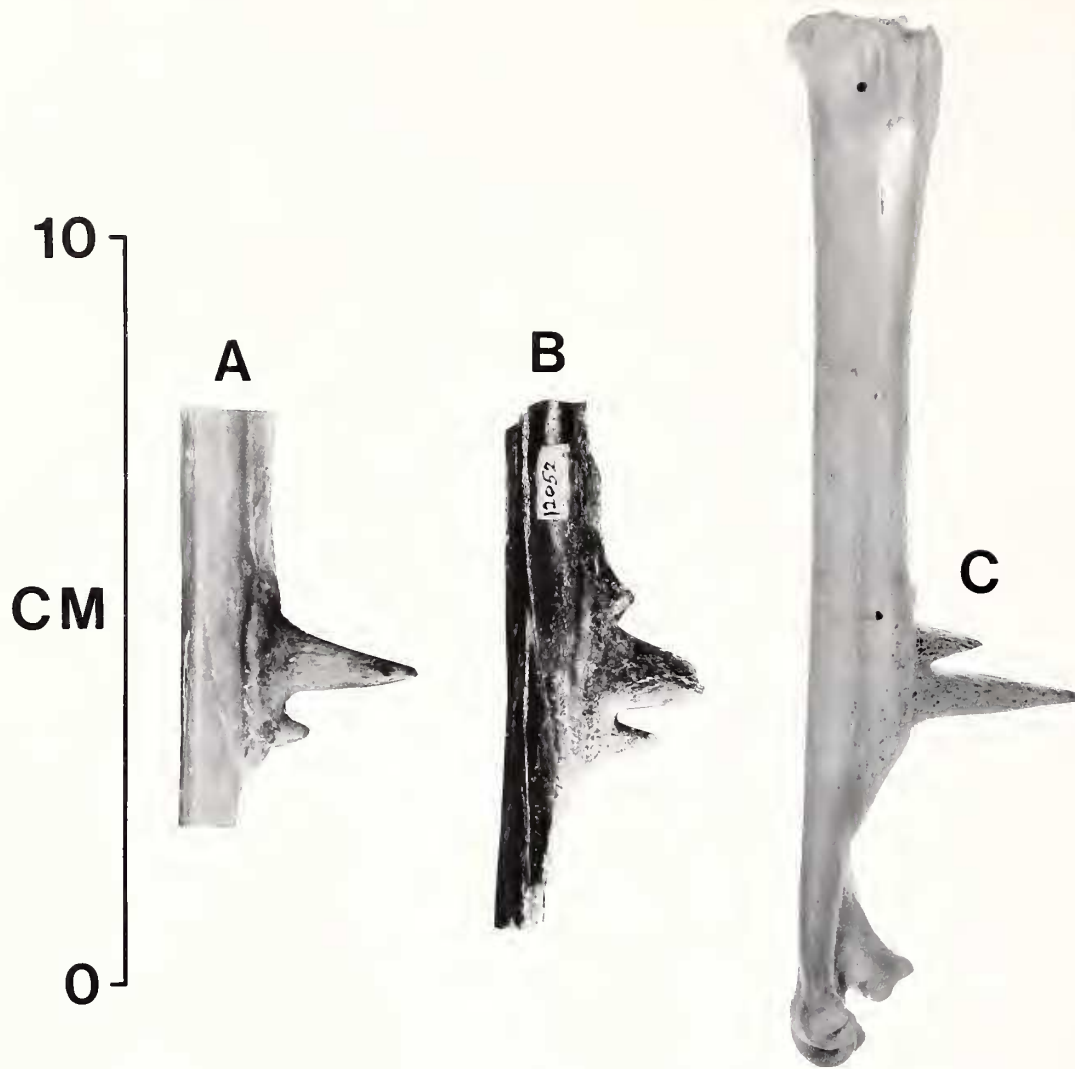


Figure 13. Medial views (A, B) and lateral view (C) tarsometatarsi of males: A. *Meleagris gallopavo osceola* (USNM 487663); B. *Meleagris gallopavo* (Seminole Field; USNM 12052—holotype of *Meleagris "tridens"*); C. *Meleagris ocellata* (PB 23542).

Figure 14. Anterior views of tarsometatarsi of females: A, B, C. *Rhegminornis calobates* (Thomas Farm; PB 8448, PB 8447, MCZ 2331—not certainly females); D. *Proagriocharis kimballensis* (UNSM Coll. Loc. Ft-40; UNSM 20037); E. *Meleagris progenes* (Rexroad; UMMP 48189); F. *Meleagris crassipes* (San Josecito Cave, LACM UC-100022); G. *Meleagris* cf. *M. leopoldi* or *M. anza* (Inglis IA; UF 20789); H. *Meleagris* sp. (Coleman IIA; UF 11601Z); I. *Meleagris californica* (Rancho La Brea; LACM E-7122); J. *Meleagris gallopavo osceola* (PB 23114); K. *Meleagris ocellata* (PB 30884).

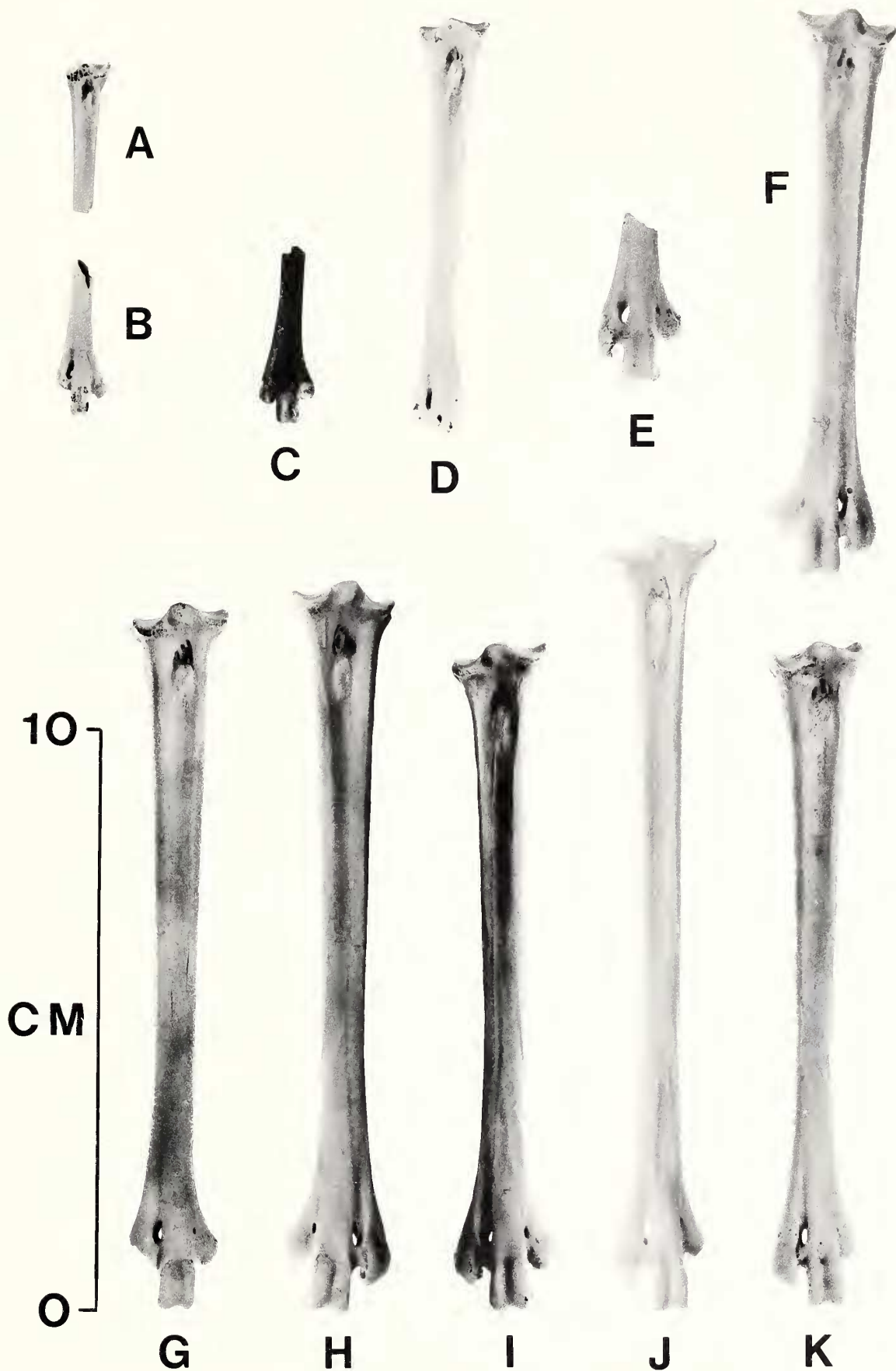


Table 1. Fossil localities discussed in text. Numbered localities are shown in Fig. 1.

Fossil Locality	Age	Species of Turkey	References*
1. Thomas Farm, Florida	early Miocene (Hemingfordian)	<i>Rhegminornis calobates</i>	Olson and Farrand 1974; Patton 1969; Wetmore 1943.
2. Westmoreland State Park, Virginia	late Miocene (Clarendonian?)	Meleagridinae, cf. <i>Meleagris</i>	Lauck Ward pers. comm.; this paper.
3. UNSM Coll. Loc. Ft-40, Nebraska	late Miocene or early Pliocene (Hemphillian)	<i>Proagriocharis kimballensis</i>	Martin and Tate 1970.
4. Buckhorn, New Mexico	late Miocene or early Pliocene (Hemphillian)	Meleagridinae, cf. <i>Meleagris</i>	This paper.
5. Clifton Country Club, Arizona	late Miocene or early Pliocene (Hemphillian)	Meleagridinae, genus and species indeterminate	This paper.
6. Bone Valley (Palmetto Mine), Florida	late Miocene or early Pliocene (Hemphillian)	Meleagridinae, cf. <i>Meleagris</i>	This paper; G. Morgan pers. comm.
7. University Drive, California	Pliocene (Hemphillian or Blancan)	<i>Meleagris</i> sp.	This paper
8. Haile XVA, Florida	late Pliocene (Blancan)	<i>Meleagris</i> sp.	Campbell 1976; Robertson 1976; this paper.
9. Benson, Arizona	late Pliocene (Blancan)	<i>Meleagris</i> cf. <i>M. progenes</i>	Brodkorb 1964b; Lindsay et al. 1975; Wetmore 1924, 1944; this paper.
10. Cita Canyon, Texas	late Pliocene (Blancan)	<i>Meleagris leopoldi</i>	Brodkorb 1964b; Lindsay et al. 1975; A. Miller and Bowman 1956; this paper.
11. Rexroad, Kansas	late Pliocene (Blancan)	<i>Meleagris progenes</i>	Brodkorb 1964b; Lindsay et al. 1975; this paper.
12. Gilliland, Texas	early Pleistocene (early Irvingtonian)	Meleagridinae, genus and species indeterminate	Brodkorb 1964b; Hibbard and Dalquest 1973; this paper.
13. Inglis IA, Florida	early Pleistocene (early Irvingtonian)	<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i>	Klein 1971; Webb 1974; this paper.
14. Vallecito Creek, California	early Pleistocene (Irvingtonian)	<i>Meleagris anza</i>	Howard 1963; Opdyke et al. 1977; this paper.
15. Port Kennedy Cave, Pennsylvania	early Pleistocene (Irvingtonian; possibly Rancholabrean?)	Meleagridinae, cf. <i>Meleagris</i>	D. Gillette pers. comm.; Mercer 1899; this paper.
16. Haile XVIIA, Florida	early Pleistocene (Irvingtonian)	<i>Meleagris</i> sp.	M. Frazier pers. comm.; this paper.
17. Williston, Florida	middle Pleistocene (late Irvingtonian)	<i>Meleagris</i> sp.	M. Frazier pers. comm.; this paper.
18. Coleman IIA, Florida	middle Pleistocene (late Irvingtonian)	<i>Meleagris</i> sp. (intermediate between <i>leopoldi-anza</i> and <i>gallopavo</i>)	Martin 1974; this paper.
19. Sante Fe River IIA, Florida	middle Pleistocene (late Irvingtonian)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Webb 1974; this paper.
20. American Falls Lake Beds, Idaho	late Pleistocene (Rancholabrean; Illinoian glacial?)	<i>Meleagris gallopavo</i>	Hopkins et al. 1969.
Papago Springs Cave, Arizona	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	Skinner 1942; Rea this volume; this paper.
Arizpe, Sonora, México	late Pleistocene (Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Cracraft 1968; Rea this volume; this paper.
Burnet Cave, New Mexico	late Pleistocene (Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i> ; also <i>M. crassipes</i>	Rea this volume; Schultz and Howard 1935; this paper.
Howell's Ridge Cave, New Mexico	late Pleistocene (Rancholabrean) and Holocene	<i>Meleagris</i> sp.; also <i>M. crassipes</i>	Rea this volume; Van Devender and Worthington 1977; this paper.
Ingleside, Texas	late Pleistocene (Rancholabrean)	<i>Meleagris gallopavo</i>	Feduccia 1973.
Sheffield Gravel Pits, Texas	late Pleistocene? (Rancholabrean?)	<i>Meleagris</i> sp.	This paper.
Carlisle Cave, Pennsylvania	Pleistocene (probably Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Leidy 1889; this paper.

Table 1. Continued.

Fossil Locality	Age	Species of Turkey	References*
Frankstown Cave, Pennsylvania	late Pleistocene (Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Hibbard et al. 1965; Peterson 1926; this paper.
Manalapan, New Jersey	late Pleistocene? (Rancholabrean?)	<i>Meleagris gallopavo</i>	This paper.
Bradenton, Florida	late Pleistocene (early Rancholabrean)	<i>Meleagris</i> sp.	Webb 1974; this paper.
Rock Spring, Florida	late Pleistocene (early Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Webb 1974; this paper.
Withlacoochee River, Florida	late Pleistocene (early Rancholabrean)	<i>Meleagris</i> sp.	Webb 1974; this paper.
Haile VIIA, Florida	late Pleistocene (early Rancholabrean)	<i>Meleagris</i> sp.	Webb 1974; this paper.
Reddick IB, Florida	late Pleistocene (early Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Webb 1974; this paper.
Melbourne, Florida	late Pleistocene (middle Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Webb 1974; this paper.
Arredondo, Florida	late Pleistocene (middle Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Webb 1974; this paper.
Sabertooth Cave, Florida	late Pleistocene (late Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Webb 1974; this paper.
Aucilla River, Florida	late Pleistocene (late Rancholabrean)	<i>Meleagris gallopavo</i>	Webb 1974; this paper.
Ichetucknee River, Florida	late Pleistocene (late Rancholabrean)	<i>Meleagris gallopavo</i>	Webb 1974; Wetmore 1931a.
Kendrick IA, Florida	late Pleistocene (late Rancholabrean)	<i>Meleagris</i> sp.	Webb 1974; this paper.
Vero, Florida	late Pleistocene (late Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Webb 1974; this paper.
Seminole Field, Florida	late Pleistocene (late Rancholabrean)	<i>Meleagris gallopavo</i>	Webb 1974; Wetmore 1931a.
Bowman IA, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	M. Frazier, S.D. Webb pers. comm.; this paper.
Davis Quarry, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris gallopavo</i>	M. Frazier, S.D. Webb pers. comm.; this paper.
Econfina River, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	M. Frazier, S.D. Webb pers. comm.; this paper.
Florida Lime Company, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	M. Frazier, S.D. Webb pers. comm.; this paper.
Haile IIA, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	M. Frazier, S.D. Webb pers. comm.; this paper.
Hog Creek, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	M. Frazier, S.D. Webb pers. comm.; this paper.
Mefford Cave I, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	M. Frazier, S.D. Webb pers. comm.; this paper.
Oakhurst Quarry, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	M. Frazier, S.D. Webb pers. comm.; this paper.
St. Mark's River, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	M. Frazier, S.D. Webb pers. comm.; this paper.
Santa Fe River IA, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	Webb 1974; this paper.
Santa Fe River IVA, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	M. Frazier, S.D. Webb pers. comm.; this paper.
Steinhatchie River, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> cf. <i>M. gallopavo</i>	M. Frazier, S.D. Webb pers. comm.; this paper.
Wekiva Run III, Florida	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	M. Frazier, S.D. Webb pers. comm.; this paper.
Wacissa River, Florida	Holocene	<i>Meleagris gallopavo</i>	This paper.

Continued

Table 1. Continued.

Fossil Locality	Age	Species of Turkey	References*
Nichol's Hammock, Florida	Holocene (pre-1900)	<i>Meleagris gallopavo</i>	Hirschfeld 1968.
Good's Shellpit, Florida	Holocene (approx. 3500–5000 BP)	<i>Meleagris gallopavo</i>	Neill et al. 1956.
Silver Glen Springs, Florida	Holocene (approx. 3500–5000 BP)	<i>Meleagris</i> sp.	Neill et al. 1956; this paper.
Buffalo Site, West Virginia	Holocene (approx. AD 1650)	<i>Meleagris gallopavo</i>	Kooliath 1975.
Hartman's Cave, Pennsylvania	Holocene (post-European contact)	<i>Meleagris gallopavo</i>	Leidy 1889; this paper.
21. Rancho La Brea, California	late Pleistocene (Rancholabrean)	<i>Meleagris californica</i>	Hibbard et al. 1965; this paper.
22. Imperial Highway, California	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	W. Miller 1971; this paper.
23. Carpinteria, California	late Pleistocene (Rancholabrean)	<i>Meleagris californica</i>	L. Miller 1927; Hibbard et al. 1965.
24. Workman and Alhambra Streets, California	late Pleistocene (Rancholabrean)	Meleagridinae cf. <i>Meleagris</i>	W. Miller 1971; this paper.
25. La Mirada, California	late Pleistocene (Rancholabrean)	<i>Meleagris</i> cf. <i>M. californica</i>	W. Miller 1971; this paper.
26. Potter Creek Cave, California	late Pleistocene (Rancholabrean)	<i>Meleagris</i> sp.	Hibbard et al. 1965; L. Miller 1911.
Dzibilchaltún, Yucatán, México	Holocene (approx. BC 1000–AD 900)	<i>Meleagris ocellata</i>	Wing and Steadman in press.
Mayapán, Yucatán, México	Holocene (approx. AD 1200–1500)	<i>Meleagris ocellata</i>	Pollock and Ray 1957.
Cancún Island, Quintana Roo, México	Holocene (approx. AD 300–900)	<i>Meleagris</i> cf. <i>M. ocellata</i>	This paper.
Tulum, Quintana Roo, México	Holocene (approx. AD 1300–1500)	<i>Meleagris</i> cf. <i>M. ocellata</i>	This paper.
Barton Ramie site, Belize	Holocene (approx. AD 500–1000)	<i>Meleagris</i> cf. <i>M. ocellata</i>	Brodkorb 1964b; this paper.
Macanché, Petén, Guatemala	Holocene (approx. AD 300–900)	<i>Meleagris</i> cf. <i>M. ocellata</i>	This paper.
27. San Josecito Cave, Nuevo León, México	late Pleistocene (Rancholabrean)	<i>Meleagris crassipes</i>	Hibbard et al. 1965; L. Miller 1940.

* Includes only literature from which this table was compiled; see references cited in this table for additional literature on the fossil sites. Earlier published records of turkeys from these sites, if recorded under a different name, are mentioned in the site by site accounts.

Table 2. Analysis of similarity. For every character in the comparative osteology section, except those that are similar in all forms, each form was rated against the others as follows: 100 = complete agreement; 75 = much agreement; 50 = partial agreement; 25 = slight agreement; 0 = no agreement. The first value in each case is the mean of all such agreement values. The number in parentheses is the number of characters on which the mean agreement value is based.

		<i>Pro- agriocharis kimballensis</i> UNSM Coll. Loc. Ft-40, Thomas Farm, Florida	<i>Mele- agris pro- genes</i> Rex- road, Kansas	<i>Mele- agris leo- poldi</i> Cita Canyon, Texas	<i>Mele- agris anza</i> , Valle- cito Creek, Cali- fornia	<i>Mele- agris</i> cf <i>M. leo- poldi</i> or <i>M. anza</i> Inglis IA Florida	<i>Mele- agris</i> sp., Cole- man IIA, Florida	<i>Mele- agris gallo- pavo</i> Recent speci- mens	<i>Mele- agris cali- fornica</i> , Rancho La Brea, Cali- fornia	<i>Mele- agris ocellata</i> Recent speci- mens	<i>Mele- agris cras- sipes</i> San Jose- cito Cave, Nuevo León, México
<i>Proagriocharis kimballensis</i> , UNSM Coll. Loc. Ft-40	75 (8)	—	—	—	—	—	—	—	—	—	—
<i>Meleagris progenes</i> Rexroad	59 (11)	50 (14)	—	—	—	—	—	—	—	—	—
<i>Meleagris leopoldi</i> Cita Canyon	71 (13)	84 (11)	92 (12)	—	—	—	—	—	—	—	—
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> Inglis IA	56 (13)	73 (21)	78 (30)	87 (17)	68 (7)	—	—	—	—	—	—
<i>Meleagris</i> sp. Coleman IIA	54 (13)	63 (21)	78 (26)	85 (17)	50 (7)	89 (64)	—	—	—	—	—
<i>Meleagris gallopavo</i> , Recent specimens	56 (13)	58 (21)	73 (30)	87 (17)	64 (7)	68 (73)	82 (65)	—	—	—	—
<i>Meleagris californica</i> , Rancho La Brea	54 (13)	54 (21)	75 (29)	82 (17)	57 (7)	78 (72)	82 (65)	80 (75)	—	—	—
<i>Meleagris ocellata</i> Recent specimens	48 (13)	58 (21)	72 (30)	78 (17)	57 (7)	68 (73)	72 (65)	62 (85)	72 (75)	—	—
<i>Meleagris crassipes</i> San Josecito Cave	52 (13)	46 (21)	73 (24)	69 (17)	57 (7)	74 (47)	72 (47)	73 (47)	79 (47)	62 (47)	—

Table 3. Analysis of similarity in the tarsometatarsus. See Table 2 for explanation of values.

	<i>Rhegmimorphus calobates</i> Thomas Farm, Florida	<i>Proagriocharis kimballensis</i> UNSM Coll. Loc. Ft-40, Nebraska	<i>Meleagris progenes</i> Rexroad, Kansas	<i>Meleagris leopoldi</i> Cita Canyon, Texas	<i>Meleagris</i> cf. <i>leopoldi</i> or <i>M. anza</i> , Inglis IA, Florida	<i>Meleagris</i> sp. Coleman IIA, Florida	<i>Meleagris gallopavo</i> Recent specimens	<i>Meleagris californica</i> fornica Rancho La Brea, California	<i>Meleagris ocellata</i> Recent specimens	<i>Meleagris crassipes</i> San Josecito Cave, Nuevo León, México
<i>Proagriocharis kimballensis</i> UNSM Coll. Loc. Ft-40	75 (8)	—	—	—	—	—	—	—	—	—
<i>Meleagris progenes</i> Rexroad	59 (11)	83 (6)	—	—	—	—	—	—	—	—
<i>Meleagris leopoldi</i> Cita Canyon	71 (13)	84 (11)	92 (12)	—	—	—	—	—	—	—
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> Inglis IA	56 (13)	77 (12)	96 (12)	87 (17)	—	—	—	—	—	—
<i>Meleagris</i> sp. Coleman IIA	54 (13)	73 (12)	94 (12)	85 (17)	96 (18)	—	—	—	—	—
<i>Meleagris gallopavo</i> Recent specimens	56 (13)	71 (12)	98 (12)	87 (17)	89 (18)	93 (18)	—	—	—	—
<i>Meleagris californica</i> Rancho La Brea	54 (13)	67 (12)	94 (12)	82 (17)	83 (18)	88 (18)	92 (18)	—	—	—
<i>Meleagris ocellata</i> Recent specimens	48 (13)	79 (12)	83 (12)	78 (17)	79 (18)	78 (18)	76 (18)	72 (18)	—	—
<i>Meleagris crassipes</i> San Josecito Cave	52 (13)	56 (12)	83 (12)	69 (17)	72 (18)	74 (18)	78 (18)	85 (18)	58 (18)	—

Table 4. Measurements (in mm) of coracoids of male turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 2 for explanation of measurements.

	Head to External End of Sternal Facet	Head to Internal Distal Angle	Head to Pneumatic Foramen	Head through Scapular Facet	Depth of Head	Least Width of Shaft
<i>Proagriocharis</i>	71.7*	67.2*	57.9*	23.1*	9.1	6.4
<i>kimbballensis</i>						
UNSM Coll. Loc. Ft-40	1	1	1	1	1	1
Meleagridinae, genus and species indet.	—	—	—	24.5	9.8	~8.2
Clifton Country Club ^a				1	1	1
<i>Meleagris progenes</i>	79.8*	—	65.0 ^b	31.0 ^b	10.8 ^b	10.1 ^b
Rexroad	1		1	1	1	1
<i>Meleagris</i> cf. <i>M.</i> <i>leopoldi</i> or <i>M. anza</i>	101.93	94.26* ± 2.52	76.21 ± 2.54	35.95 ± 1.27	13.62 ± 0.86	10.44 ± 0.45
Inglis IA	94.2–110.7	80.4–97.4*	72.6–80.2	33.9–37.8	11.8–15.0	9.6–11.2
	6	10	8	13	20	27
<i>Meleagris</i> sp.	103.72*	97.30	79.35	37.80	14.84 ± 0.49	11.12 ± 0.84
Coleman IIA	101.2–105.4*	95.3–99.0	76.0–80.8	37.0–38.7	14.2–15.8	10.0–11.9
	5	4	4	7	8	8
<i>M. gallopavo</i>	115.2*	—	—	40.8	15.5	10.8
Ingleside	1			1	1	1
<i>M. gallopavo</i>	118.5	—	90.0	43.2	16.2	12.6
Manalapan	115 ^c –122 ^d		1	1	1	1
	2					
<i>M. gallopavo</i>	117.05*	110.10	89.40	41.18	15.55	11.83
Ichetucknee River	113.9*–120.2	108.3–111.9	87.1–91.7	39.1–42.7	14.1–17.0	11.4–12.3
	2	2	2	5	6	3
<i>M. gallopavo</i>	—	—	—	38.1	14.6	—
Seminole Field				1	1	
<i>M. gallopavo</i>	104.30*	97.25*	77.10*	37.95*	14.55	11.30
Davis Quarry	101.0*–107.6*	94.8*–99.7*	75.5–78.7*	36.3–39.6*	13.5–15.6	11.0–11.6
	2	2	2	2	2	2
<i>Meleagris</i> cf. <i>M.</i> <i>gallopavo</i>	—	—	—	41.7*	16.6	—
Mefford Cave I				1	1	
<i>M. gallopavo</i>	—	—	—	39.1*	14.2	—
Nichol's Hammock				1	1	
<i>M. gallopavo</i>	106.5	98.6	82.0	37.7	14.3	9.7
Good's Shellpit	1	1	1	1	1	1
<i>M. gallopavo</i>	112.7*	102.8*	85.8*	40.0*	14.6	10.9
Garfield Site	1	1	1	1	1	1
<i>M. gallopavo</i>	115.19 ± 2.97	108.12 ± 1.98	88.94 ± 3.67	41.68 ± 1.00	16.15 ± 0.85	11.71 ± 0.46
Buffalo Site	110.0–118.5	103.7–111.0	83.2–97.5	39.9–43.3	14.1–17.7	10.5–13.3
	12	9	16	27	27	81
<i>M. gallopavo</i>	112.3	106.8*	91.0	40.8	16.0	10.4
Hartman's Cave	1	1	1	1	1	1
<i>M. gallopavo silvestris</i>	112.37 ± 4.14	104.79 ± 3.89	85.12 ± 3.39	40.71 ± 1.33	15.94 ± 0.64	11.29 ± 0.54
New York, Pennsylvania, Virginia	104.2–120.8	97.2–111.5	77.8–90.4	38.4–43.1	14.6–17.2	10.2–12.5
	26	27	27	27	28	28
<i>M. gallopavo osceola</i>	109.19 ± 4.29	101.19 ± 3.90	83.01 ± 2.94	37.94 ± 1.33	14.50 ± 0.77	10.68 ± 0.45
Florida	104.9–117.0	97.1–107.3	80.0–89.5	35.2–39.9	13.3–15.9	10.0–11.2
	9	9	9	9	9	9
<i>M. gallopavo intermedia</i>	114.7	—	87.3	38.6	15.1	10.9
Texas	1		1	1	1	1
<i>M. gallopavo mexicana</i>	113.65	104.70	83.15	40.40	16.00	11.35
Chihuahua, México	111.8–115.5	103.0–106.4	81.5–84.8	39.8–41.0	15.6–16.4	10.8–11.9
	2	2	2	2	2	2
<i>M. gallopavo</i>	111.74 ± 4.25	103.93 ± 4.06	84.59 ± 3.31	40.00 ± 1.74	15.60 ± 0.89	11.15 ± 0.57
Total skeletal specimens	104.2–120.8	97.1–111.5	77.8–90.4	35.2–43.1	13.3–17.2	10.0–12.5
	38	38	39	39	40	40

Continued

Table 4. Continued

	Head to External End of Sternal Facet	Head to Internal Distal Angle	Head to Pneumatic Foramen	Head through Scapular Facet	Depth of Head	Least Width of Shaft
<i>M. californica</i> Rancho La Brea	101.01 ± 3.97 92.0–106.1 15	94.26* ± 3.06 85.8*–98.8 29	76.54 ± 3.44 68.2–82.4 27	35.94 ± 1.19 32.3–38.2 29	13.21 ± 0.85 11.7–14.6 24	10.08 ± 0.46 9.1–11.0 29
<i>M. californica</i> Carpinteria	99.17 96.7–101.4 7	92.42* ± 2.11 89.4–94.9 8	74.34 72.7–76.4 7	35.16 ± 1.09 33.5–37.3 8	13.61 ± 0.72 12.4–14.8 8	10.02 ± 0.48 9.2–10.6 8
<i>M. californica</i> Total specimens	100.42 ± 3.48 92.0–106.1 22	93.86* ± 2.96 85.8*–98.8 37	76.08 ± 3.24 68.2–82.4 34	35.78 ± 1.20 32.3–38.2 37	13.31 ± 0.82 11.7–14.8 32	10.07 ± 0.46 9.1–11.0 37
<i>M. ocellata</i> Dzibilchaltún	93.4* 1	87.7 1	70.9 1	34.0 1	12.55 12.4–12.7 2	9.1 1
<i>M. ocellata</i> Mayapán	95.0 1	88.45 87.3–89.6 2	70.09 ± 2.23 67.2–73.2 10	32.74 ± 1.28 30.0–34.9 21	12.26 ± 0.68 10.9–13.3 21	9.14 ± 0.56 8.2–10.2 13
<i>M. ocellata</i> Yucatán, México and Petén, Guatemala	89.25 ± 3.90 81.3–93.7 10	84.08 ± 3.21 78.9–87.7 10	68.43 ± 3.17 62.0–72.2 10	31.99 ± 1.31 30.0–34.1 8	12.03 ± 0.74 10.6–12.9 10	8.81 ± 0.61 7.9–9.8 10
<i>M. crassipes</i> San Josecito Cave	79.6* 1	76.0* 1	—	29.1 1	9.8 1	8.3 1

^a May possibly represent a female; ^b from Brodkorb 1964b; ^c from Cope 1871; ^d from Marsh 1872. Probably the same bone measured by Shufeldt (1915).

* Slightly damaged specimens.

Table 5. Measurements (in mm) of the coracoid of female turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 2 for explanation of measurements.

	Head to External End of Sternal Facet	Head to Internal Distal Angle	Head to Pneumatic Foramen	Head through Scapular Facet	Depth of Head	Least Width of Shaft
Meleagridinae, genus and species indet. Gilliland	72.0** 1	70.4** 1	—	—	—	7.9 1
<i>Meleagris</i> cf. <i>M.</i> <i>leopoldi</i> or <i>M. anza</i> Inglis IA	77.90* 76.9*–78.9* 2	75.20* 74.7*–75.7* 2	60.73* 60.2*–61.1* 3	—	10.30 10.0–10.6 2	8.40 8.3–8.6 5
<i>Meleagris</i> sp. Coleman IIA	86.25 83.7–88.8 2	80.50 78.2–82.8 2	66.95 64.2–69.7 2	31.40 31.0–31.8 2	11.85 11.8–11.9 2	8.95 8.7–9.2 2
<i>Meleagris</i> cf. <i>M. gallopavo</i> Rock Spring	—	—	—	31.20 30.8–31.6 2	11.55 11.5–11.6 2	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	—	—	—	31.0 1	12.1 1	—
<i>M. gallopavo</i> Ichetucknee River	86.45* 83.1–89.8* 2	81.95* 79.9–84.0* 2	65.35 65.3–65.4 2	31.30 30.4–32.1 3	11.70 11.2–12.2 4	9.20 8.9–9.7 4
<i>M. gallopavo</i> Seminole Field	—	—	64.8 1	31.05 30.0–32.1 2	10.2 1	8.35 8.1–8.6 2

Table 5. Continued.

	Head to External End of Sternal Facet	Head to Internal Distal Angle	Head to Pneumatic Foramen	Head through Scapular Facet	Depth of Head	Least Width of Shaft
<i>Meleagris</i> sp. Florida Lime Company	— 1	77.5* 1	63.5* 1	30.1* 1	11.1* 1	8.2 1
<i>M. gallopavo</i> Nichol's Hammock	81.25 81.2–81.3 2	76.00* 75.8*–76.2 2	62.57* 59.6*–64.1 3	28.33* 28.0*–28.6 3	10.57 9.8–11.0 3	8.08 8.0–8.2 4
<i>M. gallopavo</i> Good's Shellpit	83.9 1	77.6 1	62.3 1	29.2 1	10.8 1	8.0 1
<i>M. gallopavo</i> Buffalo Site	92.11 ± 2.29 86.1–96.1 15	86.22 ± 2.37 80.7–91.5 16	70.11 ± 2.27 65.4–74.0 15	32.74 ± 1.09 30.2–35.3 32	12.44 ± 0.64 10.8–13.7 31	9.25 ± 0.45 7.9–10.5 56
<i>M. gallopavo silvestris</i> New York, Pennsylvania, Virginia	87.68 ± 1.71 85.8–90.2 13	81.57 ± 1.71 80.0–84.7 12	66.51 ± 1.88 64.2–71.0 13	32.18 ± 0.33 31.6–32.7 13	12.08 ± 0.46 11.3–13.0 13	8.78 ± 0.48 8.1–9.6 13
<i>M. gallopavo osceola</i> Florida	83.40 ± 2.24 80.6–88.0 10	77.92 ± 2.18 74.7–82.7 10	63.73 ± 2.23 60.7–67.6 11	29.73 ± 1.10 28.0–31.6 11	10.94 ± 0.76 10.0–12.4 11	8.37 ± 0.49 7.8–9.3 11
<i>M. gallopavo intermedia</i> Texas	85.8* 1	80.5* 1	65.9* 1	31.1* 1	12.0 1	8.2 1
<i>M. gallopavo mexicana</i> Chihuahua, Coahuila, México	87.80 85.2–92.5 3	81.77 79.3–86.3 3	65.37 63.3–68.4 3	31.83 30.0–34.2 3	12.57 11.6–13.8 3	8.70 8.2–9.0 3
<i>M. gallopavo merriami</i> Arizona	88.67 85.2–90.6 3	83.00 79.6–85.0 3	66.70 63.3–70.2 3	31.53 31.0–31.8 3	11.50 11.1–11.9 3	8.50 8.2–8.7 3
<i>M. gallopavo</i> Total skeletal specimens ^a	86.10 ± 3.24 79.8–92.5 31	80.21 ± 3.11 73.7–86.3 30	65.16 ± 2.79 58.1–71.0 32	31.08 ± 1.52 28.0–34.2 32	11.64 ± 0.84 10.0–13.8 32	8.56 ± 0.48 7.8–9.6 32
<i>M. californica</i> Rancho La Brea	81.64 ± 3.42 73.1–84.8 11	76.16 ± 2.50 68.9–79.2 27	61.84 ± 2.24 56.7–66.1 25	28.85 ± 1.06 25.4–30.2 24	10.86 ± 0.60 9.5–11.8 27	8.08 ± 0.47 6.8–8.8 27
<i>M. californica</i> Carpinteria	—	—	—	29.46 28.3–30.0 7	11.13 10.6–11.7 7	8.25 8.0–8.5 4
<i>M. californica</i> Total specimens	81.64 ± 3.42 73.1–89.1 11	76.16 ± 2.50 68.9–79.2 27	61.84 ± 2.24 56.7–66.1 25	28.99 ± 1.00 25.4–30.2 31	10.92 ± 0.57 9.5–11.8 34	8.10 ± 0.44 6.8–8.8 31
<i>Meleagris</i> sp. Potter Creek Cave	—	73.9* 1	59.8* 1	29.4* 1	10.2 1	7.8 1
<i>M. ocellata</i> Dzibilchaltún	—	—	—	—	—	7.5 1
<i>M. ocellata</i> Mayapán	80.9 1	73.60 71.7–75.7 4	59.38 56.9–61.2 5	26.86 ± 2.40 22.2–29.1 11	10.14 ± 0.72 9.0–11.1 11	7.61 ± 0.74 6.2–8.7 11
<i>M. ocellata</i> Yucatán, México and Petén, Guatemala	77.76 ± 1.94 74.8–80.8 10	72.93 ± 1.73 70.6–75.9 11	59.04 ± 1.97 55.5–61.6 11	26.74 ± 0.71 25.9–28.0 9	10.05 ± 0.46 9.1–11.0 11	7.39 ± 0.32 7.0–7.9 11
<i>M. crassipes</i> San Josecito Cave	—	67.30* 65.1*–68.7* 3	57.10* 55.4*–58.8 2	25.60 25.1–25.9 3	8.83 8.5–9.1 3	6.90 6.2–7.7 3

^a Includes one specimen from northern Florida not identified to subspecies.

* Slightly damaged specimen.

** Moderately damaged specimen.

Table 6. Measurements (in mm) of the scapula of male turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 2 for explanation of measurements.

	Proximal Width	Tip of Acromion to External Tip of Glenoid Facet	Depth of Glenoid Facet	Least Width of Neck
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i>	22.94 ± 0.54	26.26 ± 0.74	10.33 ± 0.51	11.36 ± 0.54
Inglis IA	22.1–24.2	25.6–27.9	9.6–11.2	10.5–12.3
	11	8	15	17
<i>Meleagris</i> sp. Coleman HA	25.57	28.83	11.20	12.50
	24.1–26.6	27.4–29.6	10.8–11.8	12.2–12.8
	3	3	3	4
<i>M. gallopavo</i> Manalapan	28.5	31.8	12.1*	14.0
	1	1	1	1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Melbourne	26.50*	28.95*	11.00	13.5
	25.6*–27.4	28.1*–29.8	10.9–11.1	
	2	2	2	1
<i>M. gallopavo</i> Ichetucknee River	—	—	10.7	12.0
			1	1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Mefford Cave	28.6	31.2	11.9	14.7
	1	1	1	1
<i>M. gallopavo</i> Buffalo Site	28.34	31.58	12.26 ± 0.64	14.50 ± 0.48
	26.9–29.2	30.2–32.4	11.2–13.2	13.7–15.4
	5	6	13	12
<i>M. gallopavo silvestris</i> , New York	27.56 ± 0.93	31.00 ± 1.09	12.38 ± 0.76	13.81 ± 0.90
Pennsylvania, Virginia	25.4–29.3	29.0–33.0	10.9–13.4	12.1–16.0
	29	27	16	29
<i>M. gallopavo osceola</i> Florida	25.61 ± 0.80	28.82 ± 1.06	11.51 ± 0.55	12.66 ± 0.76
	24.0–26.5	27.1–30.1	10.9–12.2	11.2–13.5
	8	8	8	8
<i>M. gallopavo intermedia</i> , Texas	—	29.3	—	13.0
		1		1
<i>M. gallopavo mexicana</i> Chihuahua, México	27.7	30.1	12.5	14.6
	1	1	1	1
<i>M. gallopavo merriami</i> , Arizona	27.0	29.6	11.1	13.2
	1	1	1	1
<i>M. gallopavo</i> Total skeletal specimens	27.15 ± 1.18	30.44 ± 1.38	12.06 ± 0.78	13.56 ± 0.96
	24.0–29.3	27.1–33.0	10.9–13.4	11.2–16.0
	39	38	26	40
<i>M. californica</i> Rancho La Brea	23.66 ± 0.72	26.17 ± 0.78	10.56 ± 0.50	12.04 ± 0.87
	22.4–25.2	24.8–27.9	9.6–11.3	10.8–13.8
	16	16	23	14
<i>M. californica</i> Carpinteria	23.80	26.75	10.78	11.85
	23.5–24.4	26.5–26.9	9.6–12.0	11.7–12.0
	5	4	6	2
<i>M. californica</i> Total specimens	23.69 ± 0.66	26.28 ± 0.74	10.60 ± 0.58	12.01 ± 0.82
	22.4–25.2	24.8–27.9	9.6–12.0	10.8–13.8
	21	20	29	16
<i>M. ocellata</i> Mayapán	21.75 ± 0.68	24.80 ± 0.73	9.92 ± 0.34	11.14 ± 0.56
	20.7–22.8	23.8–26.0	9.3–10.7	10.1–12.2
	12	14	28	18
<i>M. ocellata</i> Yucatán, México and Petén, Guatemala	20.14 ± 1.29	22.96 ± 1.28	9.38	10.23 ± 0.83
	18.7–22.5	21.1–25.1	8.9–10.2	9.4–11.9
	10	10	7	10

* Slightly damaged specimen.

Table 7. Measurements (in mm) of the scapula of female turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 2 for explanation of measurements.

	Proximal Width	Tip of Acromion to External Tip of Glenoid Facet	Depth of Glenoid Facet	Least Width of Neck
<i>Meleagris progenes</i>	15.9	17.9*	7.9	—
Rexroad	1	1	1	—
<i>Meleagris</i> cf. <i>M. leopoldi</i>	17.1	23.8	8.1	9.2
or <i>M. anza</i> Inglis IA	1	1	1	1
<i>Meleagris</i> sp.	21.15*	23.40*	9.45	10.30
Haile XVIA	20.1*–22.2	22.3*–24.5	8.7–10.2	9.5–11.1
	2	2	2	2
<i>Meleagris</i> sp.	22.2	24.6	9.4	—
Coleman IIA	1	1	1	—
<i>Meleagris</i> cf. <i>M. gallopavo</i>	—	—	9.1	—
Reddick IB	—	—	1	—
<i>M. gallopavo</i>	20.0	22.0	8.1	—
Seminole Field	1	1	1	—
<i>M. gallopavo</i>	19.87	22.20	8.33	9.7
Nichol's Hammock	18.9–20.5	21.2–23.0	7.9–9.1	9.7–9.9
	3	3	3	3
<i>Meleagris</i> sp.	22.0*	—	9.6	~12.0
Howell's Ridge Cave	1	—	1	1
<i>M. gallopavo</i>	22.43	25.23	9.70	11.08
Buffalo Site	22.1–23.0	24.4–26.4	9.1–10.2	10.8–11.3
	3	3	7	5
<i>M. gallopavo silvestris</i> ,	21.87 ± 0.36	24.30 ± 0.49	9.63	10.32 ± 0.54
New York, Pennsylvania,	21.0–22.3	23.2–25.0	9.0–10.3	9.4–11.1
Virginia	12	12	6	12
<i>M. gallopavo osceola</i>	20.18 ± 0.64	22.77 ± 0.54	8.75 ± 0.32	9.97 ± 0.59
Florida	18.9–21.1	22.0–23.8	7.9–9.1	9.0–11.0
	11	11	11	11
<i>M. gallopavo mexicana</i>	21.30	23.60	9.40	10.23
Chihuahua, Coahuila,	20.0–22.6	22.2–24.9	9.0–10.0	9.9–10.6
México	3	3	3	3
<i>M. gallopavo merriami</i>	21.23	23.33	9.53	10.30
Arizona	20.5–21.8	22.3–24.1	9.2–9.9	10.0–10.7
	3	3	3	3
<i>M. gallopavo</i>	21.03 ± 1.03	23.46 ± 1.05	9.13 ± 0.60	10.15 ± 0.55
Total skeletal	18.9–22.6	20.8–25.0	7.9–10.3	9.0–11.1
specimens ^a	30	30	24	30
<i>M. californica</i>	19.25 ± 0.78	21.82 ± 0.94	8.70 ± 0.50	9.40 ± 0.48
Rancho La Brea	17.9–21.2	20.7–24.6	7.8–10.0	8.7–10.8
	19	18	21	22
<i>M. californica</i>	19.53	22.10	8.98	9.50
Carpinteria	19.0–19.8	22.0–22.2	8.5–9.4	8.9–9.9
	3	4	4	3
<i>M. californica</i>	19.29 ± 0.74	21.87 ± 0.85	8.74 ± 0.49	9.41 ± 0.48
Total specimens	17.9–21.2	20.7–24.6	7.8–10.0	8.7–10.8
	22	22	25	25
<i>M. ocellata</i>	17.78	20.42	8.18 ± 0.42	8.72 ± 0.44
Mayapán	16.7–19.0	19.3–21.7	7.6–8.8	8.1–9.2
	7	6	10	10
<i>M. ocellata</i>	17.34 ± 0.40	19.51 ± 0.54	8.16 ± 0.27	8.86 ± 0.64
Yucatán, México	16.8–18.9	19.0–20.5	7.6–8.5	7.9–9.8
and Petén, Guatemala	11	11	9	11

^a Includes one specimen from northern Florida not identified to subspecies.

* Slightly damaged specimen.

Table 8. Measurements (in mm) of the humerus of male turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 3 for explanation of measurements.

	Total Length	Proximal Width	Width of Midshaft	Depth of Midshaft	Distal Width
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i>	136.69 ± 1.97	36.42 ± 0.89	15.00 ± 0.55	11.58 ± 0.42	30.05 ± 0.91
Inglis IA	132.0–141.0	34.9–38.6	14.2–16.1	10.9–12.3	28.0–32.0
	18	22	30	29	23
<i>Meleagris</i> sp. Haile XVIIA	—	—	—	—	28.1 1
<i>Meleagris</i> sp. Coleman IIA	141.72 136.9–146.8	36.83 33.6–37.8	15.21 14.0–15.9	12.04 11.2–12.4	31.30 ± 0.52 30.0–31.9
	6	7	7	7	14
<i>Meleagris</i> cf. <i>M. gallopavo</i> , Arizpe	—	38.9 1	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Burnet Cave	—	—	16.1 1	12.3 1	—
<i>Meleagris</i> sp. (juv.) North Liberty	131 1	—	—	—	—
<i>M. gallopavo</i> Carlisle Cave	—	42.3 1	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Frankstown Cave	—	—	—	—	31.4 1
<i>M. gallopavo</i> Manalapan	153.25 147.0 ^a –159.5 ^b	42 ^b 1	—	—	33 ^b 1
	2	1			
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	—	39.2 1	16.6 1	13.1 1	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Melbourne	—	—	—	—	30.1 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Arredondo	149.0 1	—	15.9 1	12.9 1	32.7 1
<i>M. gallopavo</i> Aucilla River	144.5 1	39.6 1	15.9 1	12.0 1	32.1 1
<i>M. gallopavo</i> Ichetucknee River	—	39.30 38.0–40.6 2	—	—	33.10 32.1–34.6 3
<i>M. gallopavo</i> Seminole Field	—	—	—	—	32.5 1
<i>M. gallopavo</i> Good's Shellpit	—	36.9 1	15.95 15.7–16.2 2	11.65 11.6–11.7 2	—
<i>M. gallopavo</i> Buffalo Site	157.1 ± 5.3 147–166 11	42.11 ± 0.99 39.4–44.0 28	16.63 ± 0.79 14.8–18.3 107	12.59 ± 0.59 11.1–14.1 108	33.59 ± 1.01 32.0–35.5 31
<i>M. gallopavo</i> Hartman's Cave	157.0 1	—	17.0 1	13.7 1	—
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	150.67 ± 3.38 144.0–159.0 28	40.75 ± 1.14 39.0–43.2 28	16.17 ± 0.84 14.2–17.4 29	12.56 ± 0.66 11.2–13.8 29	32.69 ± 0.84 31.3–34.3 27
<i>M. gallopavo osceola</i> Florida	148.31 ± 6.63 138.0–159.5 8	38.42 ± 1.54 36.0–40.8 8	15.65 ± 0.71 14.9–16.4 8	12.31 ± 0.54 11.5–13.1 8	31.18 ± 1.10 29.1–33.0 8
<i>M. gallopavo intermedia</i> Texas	156.0 1	39.2 1	16.2 1	12.6 1	31.8 1
<i>M. gallopavo mexicana</i> Chihuahua, México	152.5 1	40.5 1	17.3 1	13.3 1	34.1 1
<i>M. gallopavo merriami</i> , Arizona	149.5 1	39.3 1	15.7 1	12.1 1	31.4 1
<i>M. gallopavo</i> Total skeletal specimens	150.33 ± 4.26 138.0–159.5 39	40.19 ± 1.52 36.0–43.2 39	16.08 ± 0.83 14.2–17.4 40	12.52 ± 0.63 11.2–13.8 40	32.35 ± 1.11 29.1–34.3 38

Table 8. Continued.

	Total Length	Proximal Width	Width of Midshaft	Depth of Midshaft	Distal Width
<i>M. californica</i>	135.99 ± 4.24	35.35 ± 1.21	14.79 ± 0.65	11.70 ± 0.56	29.32 ± 0.96
Rancho La Brea	128.0–142.5	33.3–38.5	13.3–15.9	10.8–12.8	26.7–30.8
	34	34	34	34	34
<i>M. californica</i>	137.00	36.32 ± 0.60	14.98	12.02	29.75 ± 0.26
Carpinteria	134.1–138.5	35.5–37.0	14.7–15.6	11.4–12.7	29.2–30.0
	5	8	5	5	8
<i>M. californica</i>	136.12 ± 4.00	35.54 ± 1.18	14.82 ± 0.62	11.74 ± 0.55	29.40 ± 0.88
Total specimens	128.0–142.5	33.3–38.5	13.3–15.9	10.8–12.8	26.7–30.8
	39	42	39	39	42
<i>M. ocellata</i>	130.0	32.65	13.7	10.9	27.8
Dzibilchaltún		31.7–33.6			
	1	2	1	1	1
<i>M. ocellata</i>	127.38 ± 2.17	33.63 ± 0.60	13.24	10.10	27.53
Mayapán	123.0–129.5	32.6–34.6	12.3–14.0	9.4–10.9	26.7–28.2
	8	11	5	5	6
<i>M. ocellata</i>	123.77 ± 3.98	32.51 ± 1.34	12.68 ± 0.73	10.09 ± 0.86	26.60 ± 1.58
Yucatán, México and	118.0–130.5	30.5–34.9	11.1–13.5	8.7–11.7	24.2–28.9
Petén, Guatemala	9	9	9	9	9
<i>M. crassipes</i>	119.07	30.93	12.10	9.70	25.40
San Josecito Cave	117.1–120.2	30.6–31.2	11.3–12.7	9.2–10.5	25.2–25.6
	3	3	3	3	2

^a From Shufeldt 1915; ^b from Marsh 1872.

Table 9. Measurements (in mm) of the humerus of female turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 3 for explanation of measurements.

	Total Length	Proximal Width	Width of Midshaft	Depth of Midshaft	Distal Width
<i>Meleagris</i> cf. <i>M. leopoldi</i>	112.0	29.18	12.42	9.38	24.38
or <i>M. anza</i> Inglis IA		26.9–30.3	11.8–13.2	9.0–9.7	24.2–24.7
	1	5	4	4	4
<i>Meleagris anza</i>	112.4	~30.3	14.3	8.5	~24.0
Vallecito Creek ^a	1	1	1	1	1
<i>Meleagris</i> sp.	119.8*	31.33*	13.4	10.8	25.70
Coleman IIA		30.1*–32.0		1	24.8–26.2
	1	3	1		3
<i>Meleagris</i> sp.	122.0	31.4	13.9	10.5	26.30
Papago Springs Cave ^b					26.2–26.4
	1	1	1	1	2
<i>Meleagris</i> cf. <i>M. gallopavo</i>	125.50	32.45	13.70	10.65	26.40
Carlisle Cave	124.0–127.0	32.2–32.7	13.3–14.1	10.3–11.0	26.2–26.6
	2	2	2	2	2
<i>Meleagris</i> cf. <i>M. gallopavo</i>	—	—	—	—	24.9
Rock Spring					1
<i>M. gallopavo</i>	121.25*	31.35	12.68	9.87	26.35
Ichetucknee River	118.7*–123.8	30.9–31.8	11.9–14.0	9.2–10.6	25.2–27.0*
	2	2	4	3	4
<i>M. gallopavo</i>	—	—	—	—	25.75
Seminole Field					25.0–26.5
					2

Continued

Table 9. Continued.

	Total Length	Proximal Width	Width of Midshaft	Depth of Midshaft	Distal Width
<i>M. gallopavo</i> Good's Shellpit	120.4	29.4	12.95	9.95	24.85
	1	1	2	2	2
<i>M. gallopavo</i> Buffalo Site	127.7 ± 3.4	32.67 ± 0.86	13.26 ± 0.55	10.05 ± 0.48	26.86 ± 0.59
	123-133	30.9-33.9	11.3-14.2	8.0-11.1	25.9-28.2
	12	21	115	115	29
<i>M. gallopavo</i> Hartman's Cave	131.0	34.1	14.05	10.80	27.9
	1	1	2	2	1
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	121.84 ± 2.29	32.15 ± 0.42	12.51 ± 0.56	9.53 ± 0.51	26.08 ± 0.38
	117.0-125.0	31.7-33.3	11.7-13.2	8.9-10.3	25.3-26.8
	13	13	13	13	13
<i>M. gallopavo osceola</i> , Florida	116.14 ± 2.77	29.79 ± 0.81	12.27 ± 0.45	9.42 ± 0.28	24.53 ± 0.79
	111.2-120.2	28.2-31.2	11.5-12.9	8.9-9.8	22.9-25.8
	11	11	11	11	11
<i>M. gallopavo intermedia</i> , Texas	120.8	32.0	12.4	9.9	26.1
	1	1	1	1	1
<i>M. gallopavo mexicana</i> , Chihuahua, Coahuila, México	124.50	32.47	13.27	9.83	26.17
	121.0-129.8	31.0-34.1	12.9-13.8	9.4-10.3	24.8-27.8
	3	3	3	3	3
<i>M. gallopavo merriami</i> , Arizona	119.7	31.55	13.35	10.20	26.40
		30.8-32.3	12.8-13.9	10.1-10.3	25.8-27.0
	1	2	2	2	2
<i>M. gallopavo</i> Total skeletal specimens ^c	119.62 ± 4.13	31.23 ± 1.36	12.53 ± 0.60	9.56 ± 0.45	25.51 ± 1.03
	111.2-129.8	28.2-34.1	11.5-13.9	8.9-10.3	22.9-27.8
	30	31	31	31	31
<i>M. californica</i> Rancho La Brea	114.52 ± 3.10	28.83 ± 0.74	12.09 ± 0.55	9.31 ± 0.50	24.42 ± 0.54
	106.4-121.4	27.0-29.9	10.7-13.4	8.4-11.0	23.4-25.4
	31	27	30	31	26
<i>M. californica</i> Carpinteria	115.1	28.68	12.0	9.5	24.74
		27.7-29.4			24.2-25.7
	1	5	1	1	5
<i>M. californica</i> Total specimens	114.54 ± 3.05	28.81 ± 0.73	12.09 ± 0.54	9.32 ± 0.49	24.47 ± 0.56
	106.4-121.4	27.0-29.9	10.7-13.4	8.4-11.0	23.4-25.7
	32	32	31	32	31
<i>Meleagris</i> sp. Potter Creek Cave	116.9	31.9	~13.0	~9.9	26.2
	1	1	1	1	1
<i>M. ocellata</i> Mayapán	110.40	27.42	11.33	8.73	22.94 ± 1.68
	108.8-112.0	26.1-28.5	11.0-12.0	7.9-9.2	19.8-25.0
	2	6	3	3	8
<i>M. ocellata</i> Yucatán, México and Petén, Guatemala	107.59 ± 2.03	27.68 ± 0.54	11.16 ± 0.29	8.94 ± 0.20	22.71 ± 0.78
	104.2-110.7	26.9-28.5	10.8-11.6	8.6-9.2	21.7-24.1
	10	10	10	10	10
<i>M. crassipes</i> San Josecito Cave	105.98	27.74	11.26	8.92	22.54
	102.1-111.1	25.8-28.9	10.8-11.8	8.6-9.3	21.6-23.4
	5	5	5	5	5

^a From Howard 1963; ^b may possibly represent a male; ^c includes one specimen from northern Florida not identified to subspecies.

* Slightly damaged specimen.

Table 10. Measurements (in mm) of the ulna of male turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 4 for explanation of measurements.

	Total Length	Proximal Width	Width of Midshaft	Depth of Midshaft	Distal Depth
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> Inglis IA	134.03* $\pm$ 2.85 128.0*–139.0* 15	18.14 $\pm$ 0.75 16.0–19.0 10	8.70 $\pm$ 0.34 8.1–9.1 32	9.70 $\pm$ 0.38 9.0–10.5 32	15.16 $\pm$ 0.65 14.3–16.1 12
<i>Meleagris</i> sp. Coleman IIA	137.40 133.4–139.4 5	19.15 18.7–19.8 6	8.98 $\pm$ 0.43 8.2–9.9 12	10.39 $\pm$ 0.38 9.9–11.0 11	15.95 $\pm$ 0.30 15.3–16.3 11
<i>Meleagris</i> sp. Sheffield Gravel Pits ^a	— — —	16.5* — 1	— — —	— — —	14.7 — 1
<i>M. gallopavo</i> Manalapan	155.0* 153*–157* 2	20.00* 19.0*–21.0 2	9.57 9.0–10.0 3	10.63 10.3–10.9 3	16.05* 15.5*–16.6 2
<i>Meleagris</i> cf. <i>M. gallopavo</i> Sante Fe IIA	— — —	— — —	— — —	— — —	16.3* — 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	— — —	19.3 — 1	9.5 — 1	10.9 — 1	— — —
<i>M. gallopavo</i> Ichetucknee River	141.50* 139.0*–144.0 2	19.77 19.0–20.3 3	9.30 8.9–9.6 3	10.73 10.5–10.9 3	16.45 16.0–16.9 2
<i>M. gallopavo</i> Seminole Field	— — —	— — —	— — —	— — —	16.30 16.1–16.4 3
<i>Meleagris</i> cf. <i>M. gallopavo</i> Haile IIA	— — —	— — —	10.4 — 1	12.0 — 1	— — —
<i>Meleagris</i> cf. <i>M. gallopavo</i> Mefford Cave I	150.0 — 1	20.0 — 1	10.0 — 1	11.2 — 1	17.4* — 1
<i>Meleagris</i> sp. Santa Fe IVA	— — —	— — —	— — —	— — —	16.4* — 1
<i>M. gallopavo</i> Good's Shellpit	— — —	— — —	9.0 — 1	10.2 — 1	15.8* — 1
<i>M. gallopavo</i> Buffalo Site	152.33 150.0–157.0 3	20.18 $\pm$ 0.45 19.7–21.1 10	9.62 $\pm$ 0.42 9.0–10.7 45	10.90 $\pm$ 0.40 10.1–11.6 45	17.26 $\pm$ 0.68 16.3–18.8 16
<i>M. gallopavo silvestris</i> New York, Pennsylvania, Virginia	148.54 $\pm$ 3.63 143.0–158.0 24	19.72 $\pm$ 0.88 18.1–21.7 24	9.43 $\pm$ 0.62 8.0–10.4 23	11.00 $\pm$ 0.56 10.0–12.0 23	16.60 $\pm$ 0.57 15.2–17.9 23
<i>M. gallopavo osceola</i> , Florida	146.89 $\pm$ 5.75 139.8–156.0 8	18.89 $\pm$ 0.64 17.9–19.8 8	8.99 $\pm$ 0.49 8.2–9.8 8	10.15 $\pm$ 0.49 9.4–11.0 8	15.54 $\pm$ 0.54 14.9–16.3 8
<i>M. gallopavo intermedia</i> , Texas	157.0 — 1	20.5 — 1	10.2 — 1	10.6 — 1	16.3 — 1
<i>M. gallopavo mexicana</i> Chihuahua, México	150.0 — 1	19.3 — 1	10.0 — 1	11.2 — 1	17.9 — 1
<i>M. gallopavo</i> Total skeletal specimens	148.44 $\pm$ 4.36 139.8–158.0 34	19.53 $\pm$ 0.88 17.9–21.7 34	9.36 $\pm$ 0.62 8.0–10.4 33	10.79 $\pm$ 0.64 9.4–12.0 33	16.38 $\pm$ 0.75 14.9–17.9 33
<i>M. californica</i> Rancho La Brea	132.96 $\pm$ 3.81 124.6–139.0 36	18.14 $\pm$ 0.41 17.3–18.7 18	8.73 $\pm$ 0.25 7.9–9.3 36	9.89 $\pm$ 0.28 9.1–10.4 36	15.28 $\pm$ 0.54 14.5–16.3 22
<i>M. californica</i> Carpinteria	128.50 123.6–131.0 7	17.58 16.4–18.3 6	8.74 $\pm$ 0.30 8.1–9.1 9	9.82 $\pm$ 0.13 9.7–10.1 9	15.14 $\pm$ 0.63 14.3–16.2 8
<i>M. californica</i> Total specimens	132.23 $\pm$ 3.98 123.6–139.0 43	18.00 $\pm$ 0.54 16.4–18.7 24	8.73 $\pm$ 0.26 7.9–9.3 45	9.88 $\pm$ 0.26 9.1–10.4 45	15.24 $\pm$ 0.56 14.3–16.3 30
<i>M. ocellata</i> Dzibilchaltún	136.0 — 1	17.10* 16.2–18.0* 2	7.95 7.3–8.6 2	9.60 9.2–10.0 2	15.3 — 1

Continued

Table 10. Continued.

	Total Length	Proximal Width	Width of Midshaft	Depth of Midshaft	Distal Depth
<i>Meleagris</i> cf. <i>M. ocellata</i> , Tulum	127.0* 1	—	—	—	—
<i>M. ocellata</i>	125.70 ± 3.22	16.32 ± 1.29	7.31 ± 0.31	8.98 ± 0.63	13.50 ± 1.21
Yucatán, México and Petén, Guatemala	120.5–130.5 8	14.0–17.8 8	6.8–7.7 8	7.7–9.6 8	11.6–15.3 8
<i>M. crassipes</i>	113.95	16.0*	7.40	8.47	13.05*
San Josecito Cave	112.9–115.0 2	1 1	7.3–7.5 3	8.2–8.7 3	13.0–13.1* 2

^a May possibly represent a female.

* Slightly damaged specimen.

Table 11. Measurements (in mm) of the ulna of female turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 4 for explanation of measurements.

	Total Length	Proximal Width	Width of Midshaft	Depth of Midshaft	Distal Depth
<i>Meleagris</i> cf. <i>M. leopoldi</i>	107.75*	15.47	7.38	8.24	12.90
or <i>M. anza</i> Inglis IA	103.0*-112.5*	15.4-15.6	7.1-8.1	7.9-8.9	12.2-13.6
	2	3	6	6	4
<i>Meleagris</i> sp.	121.0	15.47	7.57	8.78	13.38*
Coleman IIA		15.3-15.8	7.3-8.0	8.2-9.3	13.0-13.7*
	1	3	3	4	4
<i>Meleagris</i> sp.	—	13.4**	—	—	12.2*
Howell's Ridge Cave		1			1
<i>M. gallopavo</i>	118.90	—	8.9	8.70	13.7
Ichetucknee River	118.2-119.6		1	8.7	
	2			2	1
<i>M. gallopavo</i>	—	14.83*	—	—	12.9*
Seminole Field		14.5*-15.1			1
		3			
<i>M. gallopavo</i>	112.08	14.38	6.88	7.68	12.10
Nichol's Hammock	107.7-115.1	13.3-15.0	6.4-7.1	7.3-7.9	11.9-12.3
	4	5	4	4	4
<i>M. gallopavo</i>	108.6	13.9	7.0	8.0	11.3
Good's Shellpit	1	1	1	1	1
<i>M. gallopavo</i>	122.50 ± 3.37	16.39 ± 0.38	7.75 ± 0.30	8.76 ± 0.34	13.86 ± 0.37
Buffalo Site	116.0-127.0	15.8-17.2	7.0-8.2	8.0-9.5	13.1-14.5
	12	10	52	52	17
<i>M. gallopavo silvestris</i> ,	118.71 ± 3.32	15.45 ± 0.42	7.14 ± 0.33	8.39 ± 0.37	13.21 ± 0.36
New York, Pennsylvania,	112.9-123.0	15.0-16.2	6.8-7.9	8.0-9.0	12.9-14.0
Virginia	12	13	12	12	12
<i>M. gallopavo osceola</i> ,	113.62 ± 3.29	14.99 ± 0.62	7.06 ± 0.17	7.84 ± 0.28	12.45 ± 0.36
Florida	109.8-120.2	13.9-16.1	6.7-7.2	7.3-8.2	11.9-12.8
	11	11	11	11	11
<i>M. gallopavo mexicana</i>	123.25	16.80	7.75	8.75	14.25
Chihuahua, México	119.1-127.4	16.1-17.5	7.3-8.2	8.4-9.1	14.0-14.5
	2	2	2	2	2
<i>M. gallopavo merriami</i> ,	125.5	18.1	7.5	9.1	14.0
Arizona	1	1	1	1	1
<i>M. gallopavo</i>	116.82 ± 5.04	15.45 ± 0.86	7.16 ± 0.34	8.18 ± 0.50	12.95 ± 0.69
Total skeletal specimens ^a	107.8-127.4	13.9-18.1	6.7-8.2	7.3-9.1	11.7-14.5
	27	28	27	27	27
<i>M. californica</i>	108.95 ± 2.98	14.37 ± 0.42	6.98 ± 0.31	8.03 ± 0.27	12.24 ± 0.36
Rancho La Brea	102.7-115.5	13.6-15.1	6.2-7.4	7.6-8.6	11.7-13.0
	21	17	21	21	16
<i>M. californica</i>	110.92	14.98	7.08	8.21	12.61 ± 0.40
Carpinteria	108.1-115.8	14.6-15.6	6.9-7.4	8.0-8.4	12.1-13.4
	4	4	7	7	8
<i>M. californica</i>	109.26 ± 3.06	14.48 ± 0.48	7.01 ± 0.28	8.08 ± 0.26	12.36 ± 0.41
Total specimens	102.7-115.8	13.6-15.6	6.2-7.4	7.6-8.6	11.7-13.4
	25	21	28	28	24
<i>M. ocellata</i>	108.39 ± 2.20	13.82 ± 0.73	6.40 ± 0.38	7.88 ± 0.35	11.78 ± 0.37
Yucatán, México and	104.1-112.1	12.8-15.0	5.8-6.8	7.3-8.3	11.1-12.3
Petén, Guatemala	10	10	10	10	10
<i>M. crassipes</i>	106.35	13.5*	6.50	7.53	11.63
San Josecito Cave	106.0-106.7		5.9-6.8	7.4-7.8	11.3-11.9
	2	1	6	6	3

^a Includes one specimen from northern Florida not identified to subspecies.

* Slightly damaged specimen.

** Moderately damaged specimen.

Table 12. Measurements (in mm) of the radius of male turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 4 for explanation of measurements.

	Total Length	Proximal Width	Proximal Depth	Least Width of Shaft	Least Depth of Shaft	Distal Width
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> Inglis IA	119.93* 117.8*–121.5* 3	9.47 9.1–10.2 6	10.64 ± 0.58 9.7–11.7 10	5.02 ± 0.18 4.6–5.3 13	4.61 ± 0.28 3.9–4.9 14	12.72 ± 0.51 11.8–13.7 11
<i>Meleagris</i> sp. Coleman IIA	120.55 119.3–121.8 2	10.12 9.8–10.4 4	11.02 10.3–11.5 4	5.48 5.1–5.7 4	4.40 4.0–5.0 3	13.40 12.9–13.9 2
<i>M. gallopavo</i> Manalapan	142* 1	—	—	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Rock Spring	—	10.3 1	—	—	4.2 1	13.1 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	—	—	—	—	4.7 1	13.1 1
<i>M. gallopavo</i> Aucilla River	135.5* 1	—	—	5.3 1	4.2 1	—
<i>M. gallopavo</i> Ichetucknee River	137.0 1	11.4 1	12.1 1	5.9 1	4.9 1	15.0 1
<i>Meleagris</i> sp. Florida Lime Co.	—	—	—	—	5.0 1	13.1* 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Mefford Cave I	133.5 1	11.0 1	12.9 1	6.0 1	5.0 1	14.9 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Steinhatchie River	137.0 1	11.0* 1	11.0* 1	6.4 1	5.6 1	13.9* 1
<i>M. gallopavo</i> Nichol's Hammock	—	—	—	5.1 1	4.6 1	13.9 1
<i>M. gallopavo</i> Buffalo Site	138.25 136.0–140.0 4	11.51 ± 0.55 10.8–12.3 15	12.15 ± 0.40 11.1–12.8 17	5.66 ± 0.31 5.2–6.2 21	4.82 ± 0.22 4.4–5.2 25	14.42 ± 0.34 14.0–15.0 13
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	134.60 ± 4.32 127.0–145.0 24	10.90 ± 0.53 9.8–11.8 23	11.83 ± 0.49 10.7–12.7 23	5.57 ± 0.38 5.0–6.4 23	4.72 ± 0.30 4.0–5.1 23	13.77 ± 0.44 12.8–15.0 23
<i>M. gallopavo osceola</i> , Florida	132.94 ± 5.00 126.7–141.9 9	9.98 ± 0.57 9.3–10.9 9	10.79 ± 0.36 10.2–11.2 9	5.14 ± 0.16 4.9–5.5 9	4.32 ± 0.24 4.0–4.7 9	12.94 ± 0.37 12.3–13.4 9
<i>M. gallopavo intermedia</i> , Texas	142.0 1	11.7 1	11.7 1	5.6 1	—	13.6 1
<i>M. gallopavo</i> Total skeletal specimens	134.38 ± 4.63 126.7–145.0 34	10.67 ± 0.69 9.3–11.8 33	11.54 ± 0.65 10.2–12.7 33	5.45 ± 0.38 4.9–6.4 33	4.61 ± 0.34 4.0–5.1 32	13.54 ± 0.55 12.3–15.0 33
<i>M. californica</i> Rancho La Brea	117.66 ± 2.62 111.5–121.6 22	9.46 ± 0.42 8.7–10.4 28	10.58 ± 0.45 9.9–11.8 28	4.99 ± 0.24 4.6–5.6 21	4.43 ± 0.21 4.0–4.9 35	12.55 ± 0.39 11.9–13.3 30
<i>M. californica</i> Carpinteria	115.98 113.8–119.1 4	9.49 ± 0.33 8.9–10.0 8	10.62 ± 0.50 9.8–11.3 8	5.12 5.0–5.4 5	4.60 4.2–4.9 6	12.43 12.1–12.8 6
<i>M. californica</i> Total specimens	117.40 ± 2.60 111.5–121.6 26	9.47 ± 0.40 8.7–10.4 36	10.59 ± 0.46 9.8–11.3 36	5.02 ± 0.23 4.6–5.6 26	4.45 ± 0.23 4.0–4.9 41	12.53 ± 0.37 11.9–13.3 36
<i>Meleagris</i> cf. <i>M. californica</i> La Mirada	120.5 1	9.9 1	10.6 1	4.9 1	4.1 1	12.3 1
<i>Meleagris</i> sp. Imperial Highway	—	—	—	—	—	12.6* 1
<i>M. ocellata</i> Yucatán, México and Petén, Guatemala	112.70 ± 2.67 108.1–117.0 8	9.00 ± 0.94 7.3–10.1 8	9.54 ± 0.73 8.6–10.6 8	4.38 ± 0.52 3.4–4.9 8	3.69 ± 0.48 2.9–4.2 8	11.21 ± 1.32 9.1–13.0 8
<i>M. crassipes</i> San Josecito Cave	97.8* 1	8.9 1	—	4.7 1	4.1 1	11.2* 1

* Slightly damaged specimen.

Table 13. Measurements (in mm) of the radius of female turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 4 for explanation of measurements.

	Total Length	Proximal Width	Proximal Depth	Least Width of Shaft	Least Depth of Shaft	Distal Width
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> Inglis IA	100.9 1 2	7.70 7.2–8.2 2	8.2 1 5	3.94 3.7–4.2 5	3.55 3.3–3.8 4	10.35 10.2–10.5 2
<i>Meleagris</i> sp. Coleman IIA	— 1	— 1	— 1	— 1	4.0 1	11.1 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Rock Spring	— 1	— 1	— 1	— 1	3.6 1	— 1
<i>M. gallopavo</i> Buffalo Site	111.60 ± 3.20 107.0–117.0 10	8.88 ± 0.38 8.1–9.5 16	9.81 ± 0.41 9.1–10.7 16	4.55 ± 0.28 4.1–5.1 13	3.94 ± 0.20 3.7–4.6 18	11.88 ± 0.34 11.4–12.9 16
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	107.70 ± 3.17 102.0–112.7 12	8.61 ± 0.32 8.2–9.2 13	9.23 ± 0.26 8.9–9.8 13	4.22 ± 0.25 3.9–4.7 12	3.65 ± 0.27 3.2–4.0 12	11.04 ± 0.40 10.3–11.8 12
<i>M. gallopavo osceola</i> , Florida	102.89 ± 3.13 99.2–108.6 11	7.84 ± 0.41 7.2–8.6 11	8.34 ± 0.40 7.8–9.1 11	4.07 ± 0.20 3.8–4.4 11	3.38 ± 0.23 3.1–3.7 11	10.52 ± 0.41 9.9–11.1 11
<i>M. gallopavo mexicana</i> Chihuahua, México	111.30 108.1–114.5 2	9.00 8.1–9.9 2	9.70 9.5–9.9 2	4.20 4.1–4.3 2	3.95 3.7–4.2 2	11.55 11.2–11.9 2
<i>M. gallopavo merriami</i> , Arizona	112.3 1	8.9 1	10.4 1	4.5 1	3.7 1	12.1 1
<i>M. gallopavo</i> Total skeletal specimens ^a	106.14 ± 4.23 99.2–114.5 27	8.32 ± 0.59 7.2–9.9 28	8.91 ± 0.66 7.8–10.4 28	4.16 ± 0.23 3.8–4.7 27	3.54 ± 0.31 3.1–4.2 27	10.87 ± 0.57 9.9–12.1 27
<i>M. californica</i> Rancho La Brea	97.72 ± 2.60 93.8–104.9 13	7.74 ± 0.38 7.1–8.4 18	8.51 ± 0.38 8.0–9.2 15	4.13 ± 0.20 3.9–4.5 13	3.59 ± 0.20 3.3–4.0 20	10.41 ± 0.30 9.8–10.8 17
<i>M. californica</i> Carpinteria	96.05 95.3–96.8 2	8.28 7.9–8.5 4	8.62 8.1–9.1 4	4.07 3.9–4.4 3	3.72 3.5–4.0 4	10.50 10.3–10.9 4
<i>M. californica</i> Total specimens	97.50 ± 2.50 93.8–104.9 15	7.84 ± 0.42 7.1–8.5 22	8.53 ± 0.40 8.0–9.2 19	4.12 ± 0.21 3.9–4.5 16	3.61 ± 0.21 3.3–4.0 24	10.43 ± 0.29 9.8–10.9 21
<i>M. ocellata</i> Yucatán, México and Petén, Guatemala	97.20 ± 2.35 92.8–100.7 10	7.66 ± 0.40 7.1–8.3 10	8.10 ± 0.30 7.7–8.8 10	3.80 ± 0.27 3.5–4.1 10	3.27 ± 0.24 2.9–3.7 10	9.83 ± 0.58 9.2–11.0 10
<i>M. crassipes</i> San Josecito Cave	— 1	— 1	— 1	4.0 1	3.5 1	— 1

^a Includes one specimen from Florida not identified to subspecies.

Table 14. Measurements (in mm) of the carpometacarpus of male turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 5 for explanation of measurements.

	Total Length	Proximal Depth	Length of Metacarpal I	Least Width of Metacarpal II	Least Depth of Metacarpal II	Greatest Depth of Intermetacarpal Space	Distal Depth	Protrusion of Metacarpal III beyond Knob of Metacarpal II
<i>Meleagris progenes</i> Rexroad	66.6 ^a 1	20.0 ^a 1	10.0 1	80 ^a 1	5.7 1	8.0* 1	17.2 1	3.8 ^a 1
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> , Inglis IA	72.63 ± 1.86 69.5–76.3 15	20.72 ± 0.64 19.6–22.0 10	10.80 ± 0.54 9.7–11.8 17	8.41 ± 0.43 7.8–9.4 27	6.26 ± 0.29 5.3–6.9 27	7.18 ± 0.47 6.4–8.0 13	18.68 ± 0.86 17.3–20.1 12	3.30 ± 0.40 2.8–4.0 17
Meleagridinae, cf. <i>Meleagris</i> , Port Kennedy Cave	73.6 1	19.6 1	12.2 1	— —	6.8 1	— —	18.0 1	4.1 1
<i>Meleagris</i> sp. Coleman IIA	75.64 73.6–77.0 5	22.00 21.4–22.8 6	11.00 10.3–11.6 6	8.55 8.2–8.9 6	6.28 5.9–6.9 6	7.48 7.0–8.5 4	19.80 18.6–20.8 3	3.50 3.1–3.9 6
<i>Meleagris</i> cf. <i>M. gallopavo</i> Rock Spring	— —	— —	— —	8.0 1	6.55 6.3–6.8 2	— —	— —	3.80 3.6–4.0 2
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	76.7 1	22.7 1	— —	8.5 1	6.4 1	— —	— —	3.57 3.3–4.0 3
<i>Meleagris</i> cf. <i>M. gallopavo</i> Melbourne	79.0 1	21.85* 21.8*–21.9* 2	11.60 11.3–11.9 2	8.20 8.2 2	6.0 — 1	— —	— —	3.9 — 1
<i>M. gallopavo</i> Ichetucknee River	78.28 ± 2.40 74.0–82.1 8	23.00 21.9–24.9 5	11.98 ± 0.44 11.3–12.7 8	8.90 ± 0.58 8.2–10.0 8	6.59 ± 0.47 6.1–7.9 9	8.28 7.8–9.1 5	21.05* 20.3–22.6* 4	3.83 3.4–4.3 7
<i>M. gallopavo</i> Seminole Field	— —	— —	11.4 1	9.25 9.1–9.4 2	6.65 6.3–7.0 2	— —	— —	4.03 3.8–4.5 3
<i>Meleagris</i> sp. Florida Lime Co.	— —	— —	— —	8.2 1	5.90 5.8–6.0 2	— —	— —	3.35 3.1–3.6 2
<i>Meleagris</i> cf. <i>M. gallopavo</i> Mefford Cave I	83.6 1	— —	13.0 1	9.5 1	6.5 1	8.1 1	21.5 1	3.8 1
<i>M. gallopavo</i> Nichol's Hammock	— —	21.8 1	12.7 1	— —	— —	— —	— —	— —
<i>M. gallopavo</i> Good's Shellpit	77.1 1	— —	— —	7.4 1	6.1 1	— —	— —	3.1 1
<i>M. gallopavo</i> Buffalo Site	82.80 ± 2.13 79.0–89.5 59	24.36 ± 0.71 22.7–26.1 61	12.31 ± 0.60 10.8–13.8 52	8.98 ± 0.54 7.5–10.1 115	6.80 ± 0.35 5.9–7.8 120	8.22 ± 0.55 6.5–9.5 65	21.56 ± 0.68 19.8–23.1 34	3.99 ± 0.41 3.0–4.9 66
<i>M. gallopavo</i> Hartman's Cave	— —	— —	— —	8.3 1	6.6 1	8.5 1	— —	— —
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	80.29 ± 2.22 76.1–83.7 26	23.60 ± 0.88 21.9–25.2 26	11.85 ± 0.48 11.0–13.1 26	8.97 ± 0.71 7.6–10.2 26	6.34 ± 0.48 5.7–7.5 26	8.00 ± 0.70 6.5–9.3 25	20.64 ± 0.74 18.9–22.1 26	4.24 ± 0.49 3.3–5.7 25
<i>M. gallopavo osceola</i> , Florida	79.60 ± 3.00 74.3–84.2 9	22.18 ± 0.78 20.6–23.2 9	11.68 ± 0.38 11.0–12.2 9	8.14 ± 0.32 7.6–8.6 9	6.41 ± 0.46 5.9–7.0 9	7.51 ± 0.42 7.0–8.2 9	19.41 ± 0.79 18.4–20.9 9	3.62 ± 0.37 3.1–4.1 9
<i>M. gallopavo intermedia</i> , Texas	84.0 1	23.1 1	14.5 1	9.0 1	6.6 1	7.4 1	19.7 1	4.2 1
<i>M. gallopavo</i> Total skeletal specimens	80.22 ± 2.46 74.3–84.2 36	23.23 ± 1.04 20.6–25.2 36	11.88 ± 0.64 11.0–14.5 36	8.77 ± 0.72 7.6–10.2 36	6.36 ± 0.47 5.7–7.5 36	7.86 ± 0.66 6.5–9.3 35	20.30 ± 0.92 18.4–22.1 36	4.08 ± 0.53 3.1–5.7 35

Table 14. Continued.

	Total Length	Proximal Depth	Length of Metacarpal I	Least Width of Metacarpal II	Least Depth of Metacarpal II	Greatest Depth of Intermetacarpal Space	Distal Depth	Protrusion of Metacarpal III beyond Knob of Metacarpal II
<i>M. californica</i>	72.62 ± 2.03	20.58 ± 0.66	11.28 ± 0.56	8.11 ± 0.54	6.25 ± 0.32	7.45 ± 0.50	19.19 ± 0.63	3.38 ± 0.38
Rancho La Brea	67.5–77.1 32	19.4–21.9 31	10.3–12.2 32	7.1–9.0 32	5.6–7.1 32	6.5–8.4 32	17.9–20.4 23	2.3–4.1 32
<i>M. californica</i>	73.80	20.76	11.36	8.33	6.32	7.50	19.25	3.33
Carpinteria	71.3–76.7 3	20.2–21.4 5	10.5–12.4 5	7.9–8.8 3	6.1–6.4 5	7.2–7.8 3	19.0–19.5 2	3.1–3.6 6
<i>M. californica</i>	72.72 ± 2.08	20.60 ± 0.64	11.29 ± 0.56	8.13 ± 0.53	6.26 ± 0.30	7.45 ± 0.48	19.19 ± 0.60	3.37 ± 0.35
Total specimens	67.5–77.1 35	19.4–21.9 36	10.3–12.4 37	7.1–9.0 35	5.6–7.1 37	6.5–8.4 35	17.9–20.4 25	2.3–4.1 38
<i>M. ocellata</i>	67.47	20.15	10.43	7.13	5.12	6.80	17.3	2.88
Dzibilchaltún	66.7–68.2 3	20.0–20.3 2	10.1–11.0 3	6.6–7.8 3	4.7–5.6 4	6.6–7.1 3	1	2.5–3.1 4
<i>Meleagris</i> cf. <i>M. ocellata</i> , Macanché	—	—	—	—	5.4 1	—	—	—
<i>M. ocellata</i>	68.03 ± 2.63	20.27 ± 0.54	10.80 ± 0.65	7.17 ± 0.64	5.42 ± 0.34	7.07 ± 0.52	18.8	3.22 ± 0.31
Mayapán	62.2–72.1 23	19.5–21.3 10	9.3–11.8 19	6.1–8.2 18	4.9–5.9 17	6.5–8.0 12	1	2.8–3.9 18
<i>M. ocellata</i>	66.42 ± 2.37	19.79 ± 0.96	10.51 ± 0.56	7.40 ± 0.62	5.27 ± 0.46	6.68	16.86 ± 1.30	3.10
Yucatán, México and Petén, Guatemala	63.3–69.4 9	18.8–21.2 9	10.0–11.6 9	6.0–8.1 9	4.5–5.9 9	6.0–7.2 7	15.1–18.8 9	2.2–3.8 7
<i>M. crassipes</i>	59.60	18.30*	9.25	7.30	4.75	6.60	16.8	3.35
San Josecito Cave	58.8–60.4 2	18.2–18.4* 2	9.1–9.4 2	7.1–7.5 2	4.6–4.9 2	6.3–6.9 2	2	3.3–3.4 2

^a From Brodkorb 1964b.

* Slightly damaged specimen.

Table 15. Measurements (in mm) of the carpometacarpus of female turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 5 for explanation of measurements.

	Total Length	Proximal Depth	Length of Metacarpal I	Least Width of Metacarpal II	Least Depth of Metacarpal II	Greatest Depth of Intermetacarpal Space	Distal Depth	Protrusion of Metacarpal III beyond Knob of Metacarpal II
<i>Meleagris progenes</i> Rexroad	—	—	—	6.05 5.8–6.3 ^a 2	—	—	—	2.7 1
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> , Inglis IA	61.25 ± 1.71 58.3–63.1 8	17.80 17.7–17.9 2	9.48 9.1–9.9 6	6.48 ± 0.38 6.2–7.6 11	5.22 ± 0.20 4.9–5.6 12	5.96 5.6–6.6 7	15.40 14.8–16.0 5	2.46 2.0–3.2 7
<i>Meleagris</i> sp. Coleman IIA	—	18.03 17.5–18.3 3	9.87 9.3–10.2 3	7.0 1	5.6 1	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Burnet Cave ^b	63.3 1	—	—	7.5 1	5.2 1	6.3 1	—	3.1 1
<i>Meleagris</i> sp. Haile VIIA	—	—	—	7.4 1	6.0 1	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	—	—	—	—	5.5 1	—	—	3.2 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Melbourne	61.3* 1	—	—	6.9 1	4.8 1	—	—	—
<i>M. gallopavo</i> Ichetucknee River	66.8 1	18.9* 1	9.9 1	7.1 1	5.2 1	6.8 1	16.0* 1	2.4 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> , Vero	60.0 1	—	—	6.2 1	4.7 1	—	—	3.2 1
<i>M. gallopavo</i> Seminole Field	—	18.7 1	9.6 1	7.3 1	5.10 2 5.1	—	—	2.82 2.3–3.1 4
<i>M. gallopavo</i> Nichol's Hammock	61.60 60.3–62.9 2	17.20 17.1–17.3 2	9.05 8.3–9.8 2	7.00 6.8–7.2 2	4.85 4.8–4.9 2	6.4 1	—	2.70 2.5–2.9 2
<i>M. gallopavo</i> Good's Shellpit	62.1 1	17.9 1	10.0 1	7.0 1	4.9 1	—	—	2.2 1
<i>M. gallopavo</i> Buffalo Site	67.68 ± 1.82 63.7–72.7 67	19.50 ± 0.58 17.6–20.9 76	10.36 ± 0.47 9.3–11.5 79	7.25 ± 0.40 6.2–8.2 145	5.29 ± 0.30 4.5–6.2 149	7.00 ± 0.45 6.0–8.0 88	17.68 ± 0.67 16.1–19.0 38	3.16 ± 0.38 2.2–4.4 94
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	65.48 ± 1.30 63.0–68.2 14	19.21 ± 0.52 18.5–20.1 14	10.06 ± 0.32 9.7–10.9 14	6.94 ± 0.34 6.3–7.8 14	4.74 ± 0.26 4.3–5.2 14	6.76 ± 0.42 6.1–7.5 14	16.87 ± 0.62 15.8–18.0 14	3.23 ± 0.35 2.8–3.9 14
<i>M. gallopavo osceola</i> , Florida	63.16 ± 2.75 59.7–67.8 11	17.54 ± 0.72 16.7–19.1 11	9.40 ± 0.55 8.7–10.4 11	6.44 ± 0.25 6.1–6.8 11	4.82 ± 0.13 4.6–5.1 11	6.05 ± 0.44 5.4–6.9 11	15.52 ± 0.67 14.4–16.5 11	2.76 ± 0.41 2.3–3.6 11
<i>M. gallopavo mexicana</i> Chihuahua, México	68.45 66.5–70.4 2	19.40 19.2–19.6 2	10.35 10.2–10.5 2	7.10 6.8–7.4 2	5.30 5.3 2	6.75 6.5–7.0 2	16.95 16.6–17.3 2	3.75 3.3–4.2 2
<i>M. gallopavo</i> ^c Total skeletal specimens	64.60 ± 2.64 59.5–70.4 28	18.51 ± 1.02 16.7–20.1 28	9.76 ± 0.60 8.4–10.9 28	6.73 ± 0.41 6.1–7.8 28	4.81 ± 0.24 4.3–5.2 28	6.45 ± 0.55 5.4–7.5 28	16.27 ± 0.95 14.4–18.0 28	3.07 ± 0.47 2.3–4.2 28
<i>M. californica</i> Rancho La Brea	61.46 ± 1.37 59.1–65.5 32	17.34 ± 0.39 16.6–18.2 32	9.83 ± 0.30 9.2–10.4 31	6.68 ± 0.40 6.0–7.5 32	5.18 ± 0.30 4.6–5.9 32	6.60 ± 0.23 6.2–7.0 32	16.48 ± 0.46 15.5–17.2 23	2.68 ± 0.25 2.2–3.2 32

Table 15. Continued.

	Total Length	Proximal Depth	Length of Metacarpal I	Least Width of Metacarpal II	Least Depth of Metacarpal II	Greatest Depth of Intermetacarpal Space	Distal Depth	Protrusion of Metacarpal III beyond Knob of Metacarpal II
<i>M. californica</i>	61.70	17.80	9.99 ± 0.46	7.07	5.01	6.42	16.58	2.73
Carpinteria	60.8–62.6	17.3–18.7	9.4–10.9	6.1–7.8	4.8–5.3	6.1–6.8	16.3–17.3	2.5–3.1
	6	7	8	6	7	5	5	7
<i>M. californica</i>	61.50 ± 1.27	17.42 ± 0.45	9.86 ± 0.34	6.74 ± 0.45	5.15 ± 0.28	6.58 ± 0.25	16.50 ± 0.45	2.68 ± 0.24
Total specimens	59.1–65.5	16.6–18.7	9.2–10.9	6.0–7.8	4.6–5.9	6.1–7.0	15.5–17.3	2.2–3.2
	38	39	39	38	39	37	28	39
<i>Meleagris</i> cf. <i>M. ocellata</i> , Tulum	56.8*	—	—	5.2	3.8	5.8	13.7	3.1
	1			1	1	1	1	1
<i>M. ocellata</i>	53.92	17.2	8.40	5.60	4.07	5.73	15.2	2.80
Mayapan	49.3–59.4		8.0–8.8	5.1–6.0	3.8–4.2	5.1–6.9		2.7–2.9
	4	1	2	3	3	3	1	2
<i>M. ocellata</i>	57.60 ± 1.27	17.09 ± 0.46	9.12 ± 0.62	6.38 ± 0.27	4.79 ± 0.18	6.02 ± 0.44	14.97 ± 0.60	2.54 ± 0.30
Yucatán, México and Petén, Guatemala	56.2–60.1	16.6–18.0	8.3–10.6	5.9–6.7	4.4–5.0	5.6–6.9	13.9–16.0	2.0–2.9
	10	10	10	10	10	8	10	8
<i>M. crassipes</i>	56.16*	16.03*	9.13*	6.70	4.48 ± 0.16	6.26	15.75	2.38
San Josecito	54.4*–57.2	15.7–16.7*	8.6–9.7*	6.6–6.8	4.3–4.8	6.0–6.7	15.7–15.8	2.2–2.6
Cave ^d	7	3	3	5	8	5	2	7

^a From Brodkorb 1964b; ^b may represent a male; ^c includes one specimen from northern Florida not identified to subspecies; ^d may possibly include one or more specimens which represent males.

* Slightly damaged specimen.

Table 16. Measurements (in mm) of the femur of male turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 5 for explanation of measurements.

	Total Length	Proximal Width	Depth of Head	Width of Midshaft	Depth of Midshaft	Distal Width	Depth of Internal Condyle	Depth of External Condyle	Depth of Fibular Condyle
<i>Meleagris progenes</i> ^a Rexroad	—	25.8* 1	—	—	—	—	—	—	—
<i>Meleagris</i> sp. University Drive	—	—	—	—	—	26.7* 1	—	22.2 1	19.9 1
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> , Inglis IA	123.21* ± 2.57 118.8*–127.0* 16	29.96 ± 0.83 29.0–31.2 14	11.29 ± 0.41 10.7–12.1 13	12.23 ± 0.50 11.2–13.3 34	10.90 ± 0.51 10.2–11.9 34	26.95 25.5–27.9 6	22.16* ± 0.82 20.2*–23.3* 14	22.55 ± 0.94 21.3–24.6 13	19.78 ± 0.86 18.7–21.1 11
<i>Meleagris</i> sp. Williston	130.0* 1	31.2 1	11.3 1	12.7 1	10.9 1	—	—	22.8 1	20.7 1
<i>Meleagris</i> sp. Coleman IIA	131.24* 129.1*–133.0 5	33.03* 32.4–34.0* 7	12.46 ± 0.41 11.8–13.2 9	12.83 ± 0.56 12.1–13.8 14	11.56 ± 0.52 10.5–12.2 14	28.70 28.2–29.4 5	23.56* 22.3*–24.7* 5	23.50 22.4–24.8 7	20.47 19.6–21.7 6
<i>Meleagris</i> cf. <i>M.</i> <i>gallopavo</i> Frankstown Cave	—	—	12.9 1	—	—	—	—	—	—
<i>M. gallopavo</i> Manalapan	147.50 145.0–150.0 ^b 2	32.6 1	13.17 13.0–13.3 3	13.60 13.2–13.9 3	12.53 12.1–13.0 3	30.1 1	25.2 1	25.1 1	21.2* 1
<i>Meleagris</i> cf. <i>M.</i> <i>gallopavo</i> , Santa Fe River IIA	133.2* 1	32.7 1	12.2 1	13.1 1	11.7 1	29.6 1	—	24.3 1	21.5 1
<i>Meleagris</i> cf. <i>M.</i> <i>gallopavo</i> Reddick IB	138.5* 1	33.7 1	12.3 1	14.0 1	11.4 1	30.55* 30.3–30.8* 2	24.50 24.0–25.0 2	25.0 24.8–25.2 2	22.8 1
<i>M. gallopavo</i> Ichetuck- nee River	141.75* 139.7*–143.8* 2	36.05 36.0–36.1 2	13.15 13.1–13.2 2	14.07 13.3–14.6 3	12.43 11.4–13.0 3	30.75* 30.1*–31.4* 2	25.2* 1	23.88* 21.0*–25.6* 4	20.65* 18.2*–21.8* 4
<i>M. gallopavo</i> Seminole Field	—	—	—	12.90 12.6–13.2 2	11.05 10.3–11.8 2	28.9* 1	25.5* 1	—	—
<i>M. gallopavo</i> Davis Quarry	—	33.5 1	12.2 1	—	—	—	—	—	—
<i>Meleagris</i> sp. St. Mark's River	—	31.7* 1	10.3* 1	—	—	—	—	—	—
<i>M. gallopavo</i> Good's Shellpit	124.60* 124.5*–124.7* 2	—	10.5 1	12.15 12.1–12.2 2	10.70 10.4–11.0 2	26.55 26.4–26.7 2	22.80 22.0–23.6 2	21.60 20.5–22.9 3	19.15 18.9–19.4 2
<i>Meleagris</i> sp. Silver Glen Springs	—	—	—	—	—	25.5 1	23.2* 1	22.1 1	19.0 1
<i>M. gallopavo</i> Buffalo Site	142.0 1	35.37 32.5–36.9 7	12.91 ± 0.40 12.1–13.5 11	13.59 ± 0.70 12.0–15.1 15	11.91 ± 0.55 11.2–13.4 15	30.93 29.7–31.6 3	—	24.28 23.4–25.3 4	21.45 20.0–22.7 4

Table 16. Continued.

	Total Length	Proximal Width	Depth of Head	Width of Midshaft	Depth of Midshaft	Distal Width	Depth of Internal Condyle	Depth of External Condyle	Depth of Fibular Condyle
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	139.30 ± 4.37 127.0–150.0 28	34.65 ± 1.20 32.6–37.1 28	12.79 ± 0.37 12.0–13.4 27	13.60 ± 0.77 12.0–15.2 28	11.99 ± 0.64 10.9–13.3 28	29.91 ± 0.85 27.9–32.0 28	24.65 ± 0.85 23.1–26.0 27	24.21 ± 0.79 22.6–25.5 27	21.06 ± 0.78 19.7–22.5 27
<i>M. gallopavo osceola</i> , Florida	135.99 ± 5.32 128.7–146.7 9	32.59 ± 1.59 30.8–34.9 9	11.59 ± 0.49 10.7–12.2 9	13.38 ± 0.58 12.2–14.1 9	11.07 ± 0.53 10.0–11.8 9	27.76 ± 0.84 26.0–29.3 9	23.73 ± 1.20 21.6–25.4 9	23.06 ± 0.96 21.4–24.8 9	20.17 ± 0.92 19.0–21.8 9
<i>M. gallopavo intermedia</i> , Texas	144.0 1	—	—	13.5 1	11.5 1	27.2 1	—	—	20.1 1
<i>M. gallopavo mexicana</i> , Chihuahua, México	145.0 1	35.6 1	12.6 1	14.8 1	12.9 1	31.1 1	25.4 1	24.7 1	22.3 1
<i>M. gallopavo merriami</i> Arizona	143.0 1	33.8 1	12.8 1	14.4 1	12.3 1	29.6 1	24.5 1	24.2 1	21.2 1
<i>M. gallopavo</i> Total skeletal specimens	138.91 ± 4.81 127.0–150.0 40	34.18 ± 1.54 30.8–37.1 39	12.50 ± 0.64 10.7–13.4 38	13.60 ± 0.74 12.0–15.2 40	11.80 ± 0.73 10.0–13.3 40	29.38 ± 1.29 26.0–32.0 40	24.45 ± 1.00 21.6–26.0 38	23.93 ± 0.98 21.4–25.5 38	20.87 ± 0.90 19.0–22.5 39
<i>M. californica</i> Rancho La Brea	124.19* ± 3.08 117.7*–132.2* 35	31.47 ± 1.25 28.6–33.8 44	11.45 ± 0.50 10.4–12.6 48	12.18 ± 0.45 11.4–13.2 43	10.25 ± 0.43 8.9–11.1 43	27.82 ± 0.85 25.8–29.3 34	22.28 ± 0.88 21.1–23.7 10	22.21 ± 0.87 20.0–23.7 26	19.95 ± 0.97 18.1–21.8 33
<i>M. californica</i> Carpinteria	127.20* 124.7*–128.8* 3	31.70 31.4–32.0 3	11.40 11.2–11.7 5	12.38 11.8–13.1 6	10.57 10.2–10.9 6	27.80 27.1–28.2 3	22.2 1	22.43 22.0–22.9 3	19.83 18.8–20.4 3
<i>M. californica</i> Total specimens	124.43* ± 3.11 117.7*–132.2* 38	31.48 ± 1.21 28.6–33.8 47	11.44 ± 0.47 10.4–12.6 53	12.20 ± 0.45 11.4–13.2 49	10.29 ± 0.43 8.9–11.1 49	27.82 ± 0.82 25.8–29.3 37	22.27 ± 0.83 21.1–23.7 11	22.23 ± 0.84 20.0–23.7 29	19.94 ± 0.96 18.1–21.8 36
<i>M. ocellata</i> Yucatán, México, and Petén, Guatemala	110.84 ± 3.37 105.6–116.9 10	25.96 ± 1.15 24.1–27.8 10	9.36 ± 0.44 8.9–10.2 8	10.40 ± 0.66 9.3–11.7 10	9.49 ± 0.66 8.3–10.2 10	23.63 ± 1.05 22.1–25.2 10	19.04 ± 1.22 17.2–20.6 8	18.86 ± 0.78 18.0–20.1 8	16.42 ± 0.95 15.3–18.1 8
<i>M. crassipes</i> San Jose- cito Cave	107.8* 1	26.7 1	10.2 1	10.1 1	9.1 1	23.10* 23.0–23.2* 2	19.1 1	18.5 1	14.9 1

^a From Brodkorb 1964b; ^b larger measurement from Marsh 1872, and Shufeldt 1915.

* Slightly damaged specimen.

	Total Length	Proximal Width	Depth of Head	Width of Midshaft	Depth of Midshaft	Distal Width	Depth of Internal Condyle	Depth of External Condyle	Depth of Fibular Condyle
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> , Inglis IA	102.47* 99.4*–105.2* 3	23.35 23.0–23.7 2	8.88 8.6–9.2 4	9.73 9.1–10.2 6	8.45 8.2–8.9 6	21.70 21.3–22.0 3	17.72* 17.2*–18.7* 4	17.50 17.0–18.3 4	15.04 14.4–16.1 5
Meleagridinae, gen. and sp. indet. Gilliland ^{a,b}	—	25.5* 1	9.2* 1	—	—	—	—	—	—
<i>Meleagris</i> sp. Coleman IIA	—	27.4 1	9.6 1	11.2 1	10.6 1	23.7 1	21.2* 1	20.10 19.7–20.5 2	16.9* 1
<i>Meleagris</i> sp. Papago Springs Cave ^b	~110 1	~26.2 1	—	—	—	—	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Burnet Cave	—	—	—	10.7 1	9.6 1	—	—	—	—
<i>Meleagris</i> sp. Haile VIIA	114.4 1	26.3 1	9.9 1	10.3 1	9.6 1	24.0 1	20.2 1	19.7 1	17.0 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	—	—	—	—	—	23.5 1	—	19.1 1	16.8 1
<i>M. gallopavo</i> , Ichetucknee River	—	—	—	10.65 10.3–11.0 2	9.30 8.9–9.7 2	22.5* 1	18.6* 1	18.0* 1	16.0* 1
<i>M. gallopavo</i> Seminole Field	—	26.1 1	9.2 1	—	—	22.65 22.3–23.0 2	—	18.25 17.8–18.7 2	15.70 15.2–16.2 2
<i>Meleagris</i> sp. Hog Creek	—	26.8 1	9.8 1	—	—	—	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Sante Fe IA	115.4* 1	25.8* 1	—	11.8 1	9.9 1	23.3* 1	—	18.9* 1	17.4* 1
<i>M. gallopavo</i> Nichol's Hammock	104.10* 101.4–106.8* 2	24.70 24.0–25.4 2	8.80 8.6–9.0 2	9.75 9.5–10.0 2	8.65 8.2–9.1 2	21.00 20.2–21.8 2	—	17.65 17.5–17.8 2	15.45 15.3–15.6 2
<i>M. gallopavo</i> Good's Shellpit	—	—	8.5 1	10.2 1	9.1 1	—	—	—	—
<i>M. gallopavo</i> Buffalo Site	117.27 ± 3.17 112.9–122.0 9	27.42 ± 0.57 26.1–28.4 20	10.14 ± 0.41 9.5–11.0 24	11.22 ± 0.50 10.3–11.8 29	9.63 ± 0.42 8.9–10.3 29	23.85 ± 0.61 22.9–25.0 10	20.00 19.2–20.8 5	19.46 ± 0.44 18.4–20.0 14	17.02 ± 0.57 16.3–18.3 12
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	113.57 ± 3.16 108.9–119.0 12	26.28 ± 0.64 25.1–27.3 12	9.81 ± 0.31 9.3–10.2 12	10.68 ± 0.43 9.9–11.2 12	9.31 ± 0.52 8.6–10.1 12	22.87 ± 0.50 22.1–23.5 12	19.04 ± 0.54 17.9–19.9 12	18.52 ± 0.51 18.0–19.3 12	15.95 ± 0.51 15.1–16.7 12

Table 17. Continued.

	Total Length	Proximal Width	Depth of Head	Width of Midshaft	Depth of Midshaft	Distal Width	Depth of Internal Condyle	Depth of External Condyle	Depth of Fibular Condyle
<i>M. gallopavo osceola</i> , Florida	108.50 ± 2.49 104.0–113.9 11	25.33 ± 0.97 23.9–27.2 11	8.81 ± 0.34 8.2–9.2 11	10.46 ± 0.41 9.8–11.2 11	8.72 ± 0.48 8.1–9.7 11	21.16 ± 0.89 20.0–23.5 11	18.65 ± 0.83 17.8–20.5 11	17.78 ± 0.62 16.9–19.1 11	15.55 ± 0.79 14.8–17.3 11
<i>M. gallopavo mexicana</i> , Chihuahua, Coahuila, México	116.90 112.0–124.2 3	26.80 25.4–28.5 3	10.03 9.7–10.5 3	11.30 10.9–11.6 3	9.83 9.3–10.2 3	23.67 22.5–25.0 3	19.57 18.1–21.4 3	19.20 17.4–20.6 3	16.93 15.1–18.6 3
<i>M. gallopavo merriami</i> Arizona	115.80 112.4–119.3 3	27.17 26.9–27.5 3	10.03 9.8–10.4 3	11.20 11.0–11.4 3	9.97 9.9–10.1 3	23.67 23.3–23.9 3	18.73 18.1–19.1 3	18.47 18.0–18.8 3	16.23 15.9–16.8 3
<i>M. gallopavo</i> Total skeletal specimens ^c	112.01 ± 4.54 104.0–124.2 30	26.04 ± 1.04 23.9–28.5 30	9.43 ± 0.65 8.2–10.5 30	10.69 ± 0.49 9.8–11.6 30	9.18 ± 0.65 8.1–10.2 30	22.36 ± 1.23 20.0–25.0 30	18.92 ± 0.80 17.8–21.4 30	18.26 ± 0.83 16.9–20.6 30	15.90 ± 0.86 14.8–18.6 30
<i>M. californica</i> Rancho La Brea	104.66* ± 2.92 99.4–111.8* 23	25.35 ± 0.96 22.9–27.3 33	9.28 ± 0.42 8.3–10.1 33	10.03 ± 0.48 9.1–10.8 23	8.47 ± 0.42 7.7–9.2 23	22.03 ± 0.89 20.4–23.4 14	17.45 16.8–18.4 4	17.06 ± 0.70 15.7–17.8 17	15.28 ± 0.79 13.8–16.0 16
<i>M. californica</i> Carpinteria	103.90* 103.1–104.7* 2	25.60 24.3–27.1 6	9.40 8.7–9.8 6	10.32 9.9–10.8 4	8.52 8.3–8.9 4	22.20 21.8–22.4 4	17.8 17.2–18.1 1	17.58 17.2–18.1 4	15.38 15.1–16.0 4
<i>M. californica</i> Total specimens	104.60* ± 2.82 99.4*–111.8* 25	25.39 ± 0.97 22.9–27.3 39	9.29 ± 0.42 8.3–10.1 39	10.07 ± 0.48 9.1–10.8 27	8.48 ± 0.40 7.7–9.2 27	22.07 ± 0.79 20.4–23.4 18	17.52 16.8–18.4 5	17.16 ± 0.68 15.7–18.1 21	15.30 ± 0.72 13.8–16.0 20
<i>M. ocellata</i> Dzibil- chaltún	98.0* 1	—	—	9.3 1	9.4 1	—	—	—	—
<i>M. ocellata</i> Yucatán, México, and Petén, Guatemala	97.54 ± 1.84 94.9–101.1 11	22.26 ± 0.81 20.9–23.7 11	8.11 ± 0.43 7.6–8.9 9	9.30 ± 0.46 8.7–10.1 11	8.37 ± 0.51 7.4–9.3 11	20.07 ± 0.47 19.3–21.0 11	16.33 ± 0.79 15.5–17.8 9	16.34 ± 0.46 15.6–17.0 9	14.26 ± 0.51 13.8–15.3 9
<i>M. crassipes</i> San Jose- cito Cave	94.05* 91.3*–96.8* 2	23.05 22.5–23.6 2	8.70 8.5–8.8 4	9.39 ± 0.55 8.6–10.3 8	8.51 ± 0.34 8.1–8.9 8	20.9* 1	—	16.0* 1	13.6 1

^a From Brodkorb 1964b; ^b may possibly represent a male; ^c includes one specimen from northern Florida not identified to subspecies.

* Slightly damaged specimen.

Table 18. Measurements (in mm) of the tibiotarsus of male turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 6 for explanation of measurements.

	Length With- out Cnemial Crest†	Width of Head	Width of Midshaft	Depth of Midshaft	Distal Width	Depth of Internal Condyle	Depth of External Condyle
Meleagridinae cf. <i>Meleagris</i> Buckhorn	—	—	—	—	18.9* 1	19.1* 1	—
<i>Meleagris</i> sp. Haile XVA	—	—	~12.4 1	~9.9 1	18.4* 1	19.5* 1	17.9* 1
<i>Meleagris</i> cf. <i>M.</i> <i>leopoldi</i> or <i>M.</i> <i>anza</i> , Inglis IA	205.2 199.5–208.5 4	23.43 ± 0.72 22.5–24.8 10	11.74 ± 0.47 10.3–12.4 24	9.10 ± 0.40 8.3–9.8 25	19.58 ± 0.83 18.3–21.7 22	19.24* ± 0.58 18.6–20.5* 11	17.92* ± 0.75 16.8–19.8* 20
<i>Meleagris</i> sp. Haile XVIIA	—	—	—	—	—	18.5* 1	—
<i>Meleagris</i> sp. Coleman IIA	208.5 207.0–210.0 4	25.10 ± 0.76 24.2–26.1 8	12.34 ± 0.52 11.5–13.0 9	9.34 ± 0.44 8.7–9.8 8	21.09 ± 0.47 20.3–21.6 10	21.08 20.6–21.8 6	18.95 ± 0.25 18.6–19.5 12
<i>M. gallopavo</i> Ingleside	—	—	12.1 1	9.1 1	21.50* 21.2*–21.8 2	20.30* 19.9*–20.7* 2	18.85* 18.7*–19.0 2
<i>Meleagris</i> cf. <i>M. gallopavo</i> , Frankstown Cave	—	—	—	—	21.90 21.9 2	21.05* 20.9*–21.2* 2	19.35* 19.2–19.5* 2
<i>M. gallopavo</i> Manalapan ^a	245 1	30 ^b 1	12.5 1	10.5 1	17 ^c 1	—	17.3 1
<i>M. gallopavo</i> Manalapan	243.75* 243 ^d –244.5* ^e 2	—	—	—	18 ^{c,d} 1	—	—
<i>M. gallopavo</i> Manalapan ^f	235.5* 233*–238* 2	26.3 1	11.75* 11.4*–12.1 2	9.95 9.8–10.1 2	20.0* 1	19.4* 1	17.9* 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Sante Fe IIA	213.0 1	24.2 1	12.6 1	9.1 1	20.9 1	19.8* 1	18.7* 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Rock Spring	—	—	11.8 1	9.0 1	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	233.5 1	25.30 24.1–26.5 2	13.0 1	10.3 1	21.9 1	22.4 1	20.2 1
<i>M. gallopavo</i> Aucilla River	—	—	—	—	21.0* 1	20.8* 1	19.0* 1
<i>M. gallopavo</i> Ichetucknee River	230.5 226.5–233.5 4	26.33 25.7–27.0 3	12.54 ± 1.10 10.7–14.1 11	9.85 ± 0.87 8.8–11.4 11	21.81* ± 1.06 20.4*–23.6* 12	21.18* ± 1.04 19.8–22.3* 9	19.92 ± 0.86 18.5–21.2 11
<i>M. gallopavo</i> Seminole Field	—	—	—	—	21.43 21.0–22.1 3	—	19.10 19.0–19.2 2
<i>Meleagris</i> sp. Oakhurst Quarry	—	—	—	—	21.0* 1	—	19.9* 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Sante Fe IA	—	—	—	—	19.3** 1	19.8** 1	17.5** 1
<i>Meleagris</i> sp. Sante Fe IVA	—	—	~12.2 1	~9.2 1	19.7* 1	—	—
<i>Meleagris</i> sp. Wekiva Run III	—	—	—	—	20.6* 1	20.9* 1	18.1* 1
<i>M. gallopavo</i> Nichol's Hammock	—	—	—	—	20.8 1	—	19.7 1
<i>M. gallopavo</i> Good's Shellpit	—	23.2 1	—	—	—	—	—

Table 18. Continued.

	Length With- out Cnemial Crest†	Width of Head	Width of Midshaft	Depth of Midshaft	Distal Width	Depth of Internal Condyle	Depth of External Condyle
<i>M. gallopavo</i>	230.0	26.25	12.33 ± 0.63	9.98 ± 0.52	22.50 ± 0.91	22.07	19.80 ± 0.64
Buffalo Site	226.0–234.0	25.5–27.0	10.7–13.2	9.0–11.1	20.2–24.8	21.4–23.1	18.1–21.3
	2	2	15	15	22	6	34
<i>M. gallopavo</i>	220.3 ± 6.9	25.10 ± 0.59	12.15 ± 0.63	9.63 ± 0.46	21.93 ± 0.85	21.63 ± 0.82	19.53 ± 0.40
<i>silvestris</i> , New York, Pennsyl- vania, Virginia	200.0–233.0	24.0–26.2	10.9–13.1	8.8–10.4	20.3–23.3	20.1–22.9	18.8–20.1
	26	23	26	26	26	25	25
<i>M. gallopavo</i>	231.9 ± 10.6	23.20 ± 0.92	11.79 ± 0.69	9.28 ± 0.40	20.70 ± 0.88	20.58 ± 1.29	18.79 ± 1.18
<i>osceola</i> , Florida	221.5–253.0	21.6–24.5	10.9–13.0	8.8–10.1	19.0–22.2	18.1–22.6	17.0–20.2
	9	9	9	9	10	10	10
<i>M. gallopavo</i>	231.0	—	12.2	10.0	21.5	20.7	18.8
<i>intermedia</i> , Texas	1		1	1	1	1	1
<i>M. gallopavo</i> , <i>mexicana</i> , Chihuahua, México	227.0	26.2	12.8	10.3	23.5	23.1	20.4
	1	1	1	1	1	1	1
<i>M. gallopavo</i>	225.5	24.8	12.5	10.0	22.6	22.7	19.6
<i>merriami</i> , Arizona	1	1	1	1	1	1	1
<i>M. gallopavo</i>	223.6 ± 9.1	24.62 ± 1.11	12.09 ± 0.64	9.59 ± 0.47	21.66 ± 1.03	21.38 ± 1.10	19.29 ± 0.74
Total skeletal specimens	200.0–253.0	21.6–26.2	10.9–13.1	8.8–10.4	19.0–23.5	18.1–23.1	17.0–20.4
	38	35	38	38	39	38	38
<i>M. californica</i>	203.5 ± 6.2	23.27 ± 0.61	11.26 ± 0.53	8.96 ± 0.36	20.00 ± 0.54	19.79 ± 0.74	18.03 ± 0.72
Rancho La Brea	192.0–212.0	22.6–24.5	10.9–11.9	8.0–9.4	19.3–20.9	18.8–21.2	17.2–19.9
	15	9	18	18	23	14	21
<i>M. californica</i>	202.4	23.56	11.22	9.14	19.70 ± 0.36	19.76 ± 0.52	17.98 ± 0.30
Carpinteria	199.0–204.5	22.8–24.3	11.0–11.3	8.6–9.5	19.2–20.3	19.3–20.7	17.6–18.6
	4	5	5	5	11	8	9
<i>M. californica</i>	203.2 ± 5.6	23.37 ± 0.60	11.25 ± 0.47	9.00 ± 0.36	19.90 ± 0.50	19.78 ± 0.65	18.02 ± 0.62
Total specimens	192.0–212.0	22.6–24.5	10.9–11.9	8.0–9.5	19.2–20.9	18.8–21.2	17.2–19.9
	19	14	23	23	34	22	30
<i>M. ocellata</i>	176.5	—	10.15	8.35	18.35	—	16.40
Dzibilchaltún			9.6–10.7	8.1–8.6	17.6–19.1		15.8–17.0
	1		2	2	2		2
<i>Meleagris</i> cf. <i>M. ocellata</i> Macanché	—	—	—	—	19.0* 1	—	16.2** 1
<i>M. ocellata</i>	183.50 ± 5.46	19.86 ± 1.11	10.08 ± 0.69	7.92 ± 0.49	17.86 ± 0.98	17.87	16.30
Yucatán, México and Petén, Guatemala	175.0–193.0	18.4–21.8	8.9–10.9	7.3–8.6	16.6–19.2	16.9–19.0	15.3–17.6
	9	10	9	9	9	7	7
<i>M. crassipes</i>	164.0	20.0	10.4	8.0	18.1	17.1*	15.45*
San Josecito Cave	163.5–164.5						15.2–15.7*
	2	1	1	1	1	1	2

^a From Cope, 1871; ^b abnormally large probably because of a difference in position of specimen during measurement; ^c abnormally small, probably because of misinterpretation of described measurement or fragmentary nature of specimen; ^d from Marsh 1872; ^e from Shufeldt 1915. This is probably the specimen which Marsh measured; ^f specimens measured by the author.

† Measurements accurate only to within 0.5 mm.

* Slightly damaged specimen.

** Moderately damaged specimen.

Table 19. Measurements (in mm) of the tibiotarsus of female turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 6 for explanation of measurements.

	Length With- out Cnemial Crest†	Width of Head	Width of Midshaft	Depth of Midshaft	Distal Width	Depth of Internal Condyle	Depth of External Condyle
Meleagridinae cf. <i>Meleagris</i> Westmoreland, Park ^{a,b}	—	18.5* 1	—	—	15.0* 1	16.1 1	14.0* 1
Meleagridinae cf. <i>Meleagris</i> , Bone Valley (Palmetto Mine)	—	—	—	—	16.8* 1	16.5* 1	14.9 1
<i>Meleagris progenes</i> Rexroad	—	—	—	—	14.5* 1	15.2* 1	13.0* 1
<i>Meleagris</i> cf. <i>M.</i> <i>leopoldi</i> or <i>M. anza</i> Inglis IA	—	18.72 18.4–19.4 4	9.85 9.5–10.2 2	7.80 7.7–7.9 2	16.07 16.0–16.1 3	15.85* 15.7*–16.1* 4	14.38* 13.9*–15.0 4
<i>Meleagris</i> sp. Coleman IIA	—	—	10.45 10.2–10.7 2	8.40 8.0–8.8 2	17.88 17.0–18.8 5	17.80* 17.2–18.7* 4	16.05 15.6–16.5 2
<i>Meleagris</i> cf. <i>M.</i> <i>gallopavo</i> Burnet Cave	—	—	10.3 1	8.3 1	18.4* 1	18.0* 1	16.3* 1
<i>M. gallopavo</i> Ingleside	—	—	—	—	17.9* 1	—	15.9 1
<i>M. gallopavo</i> Manalapan ^c	183 1	19 1	9.6 1	—	16.5 1	—	16 1
<i>M. gallopavo</i> Manalapan ^d	180* 1	—	—	—	17.0 1	17.4* 1	15.9 1
<i>M. gallopavo</i> Aucilla River	—	—	—	—	15.2* 1	17.0* 1	—
<i>M. gallopavo</i> Ichetucknee River	178.0 175.5–180.5 2	21.4 1	10.17 9.5–11.0 6	8.27 7.7–8.8 6	17.42* ± 1.11 15.2*–18.8 12	17.00* ± 1.03 14.8*–18.2 11	15.39* ± 0.89 13.7*–16.5 12
<i>Meleagris</i> sp. Kendrick	—	—	—	—	17.0 1	18.0* 1	15.8 1
<i>M. gallopavo</i> Seminole Field	—	—	—	—	17.0 1	16.2 1	15.30 14.7–16.0 3
<i>Meleagris</i> sp. Econfina River	176.0* 1	—	—	—	14.9* 1	—	14.9* 1
<i>Meleagris</i> sp. Hog Creek	—	—	—	—	18.3* 1	—	—
<i>Meleagris</i> sp. Santa Fe IVA	—	—	9.7 1	7.8 1	—	—	—
<i>M. gallopavo</i> Nichol's Hammock	172.3 169.5–174.0 3	17.30 17.1–17.7 3	8.54 8.2–9.0 5	7.04 6.9–7.1 5	15.67 15.1–16.8 3	15.93 15.8–16.1 3	14.55 14.1–15.0 4
<i>M. gallopavo</i> Good's Shellpit	—	—	—	—	16.6* 1	16.1* 1	14.5 1
<i>M. gallopavo</i> Buffalo Site	185.7 182.0–189.0 3	20.92 20.0–22.0 6	10.17 ± 0.42 9.5–10.9 16	8.17 ± 0.22 7.9–8.6 15	18.03 ± 0.55 16.9–19.0 28	18.29 ± 0.84 17.0–20.1 11	15.97 ± 0.56 15.0–17.0 32
<i>M. gallopavo</i> Hartman's Cave	—	—	—	—	18.00 17.9–18.1 2	16.45 16.1–16.8 2	15.45 15.1–15.8 2
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	175.7 ± 6.3 164.0–187.0 12	19.48 ± 0.45 18.9–20.2 9	9.24 ± 0.41 8.8–10.0 12	7.42 ± 0.33 7.0–8.0 12	17.42 ± 0.40 16.9–18.1 12	17.23 ± 0.39 16.5–17.9 12	15.58 ± 0.43 15.1–16.4 12
<i>M. gallopavo osceola</i> , Florida	178.1 ± 4.4 171.0–186.5 10	18.04 ± 0.65 17.3–19.6 11	9.17 ± 0.24 8.9–9.7 11	7.35 ± 0.30 6.8–7.8 11	16.44 ± 0.56 15.7–17.6 10	16.40 ± 0.62 15.4–17.5 10	14.92 ± 0.31 14.4–15.5 10
<i>M. gallopavo mexicana</i> , Chihuahua, Coahuila, México	183.5 178.0–190.0 3	20.07 19.5–21.2 3	10.17 9.8–10.5 3	7.90 7.6–8.1 3	18.40 17.2–19.3 3	18.17 17.0–19.6 3	16.13 14.8–17.3 3

Table 19. Continued.

	Length With- out Cnemial Crest†	Width of Head	Width of Midshaft	Depth of Midshaft	Distal Width	Depth of Internal Condyle	Depth of External Condyle
<i>M. gallopavo merriami</i> , Arizona	175.5 170.0–181.0 2	19.73 19.1–20.3 3	9.83 9.5–10.1 3	8.13 7.5–8.9 3	17.60 17.6 2	17.55 17.2–17.9 2	15.30 15.3 2
<i>M. gallopavo</i> Total skeletal specimens ^c	177.0 ± 6.1 164.0–190.0 28	18.94 ± 1.01 17.3–21.2 27	9.35 ± 0.47 8.8–10.5 30	7.51 ± 0.43 6.8–8.9 30	17.12 ± 0.86 15.7–19.3 28	17.00 ± 0.86 15.4–19.6 28	15.43 ± 0.66 14.2–17.3 28
<i>M. californica</i> Rancho La Brea	168.4 ± 3.1 164.0–173.0 8	19.25 ± 0.54 18.4–19.9 8	9.25 ± 0.30 8.8–9.8 16	7.69 ± 0.37 6.9–8.3 16	16.74 ± 0.43 15.8–17.7 26	16.60 ± 0.38 15.6–17.3 25	15.11 ± 0.40 14.1–15.9 27
<i>M. californica</i> Carpinteria	168.7 165.0–174.0 3	18.8 — 1	9.70 9.5–10.0 3	7.50 7.4–7.7 3	16.66 16.1–17.3 5	16.66 15.6–17.8 5	15.00 14.3–15.5 6
<i>M. californica</i> Total specimens	168.4 ± 3.4 164.0–174.0 11	19.20 ± 0.53 18.4–19.9 9	9.32 ± 0.33 8.8–10.0 19	7.66 ± 0.35 6.9–8.3 19	16.73 ± 0.43 15.8–17.7 31	16.61 ± 0.46 15.6–17.8 30	15.09 ± 0.40 14.1–15.9 33
Meleagridinae cf. <i>Meleagris</i> , Workman and Alhambra Streets	—	—	—	—	16.3 1	—	14.5 1
<i>M. ocellata</i> Dzibilchaltún	—	—	7.9 1	7.0 1	15.4 1	14.6 1	13.2 1
<i>M. ocellata</i> Yucatán, México, and Petén, Guatemala	158.2 ± 4.7 150.5–167.0 9	17.14 ± 0.52 16.5–18.1 11	8.81 ± 0.23 8.5–9.1 9	7.11 ± 0.41 6.4–7.6 9	15.02 ± 0.46 14.2–16.0 10	14.95 ± 0.72 14.1–16.1 8	13.66 ± 0.50 13.1–14.5 8
<i>M. crassipes</i> San Josecito Cave	150.7* 150.0–152.0* 3	18.6 — 1	9.45 9.0–9.9 2	7.60 7.2–8.0 2	17.45 17.4–17.5 2	15.90* 15.8*–16.0* 2	14.18 13.7–14.6 4

^a Based on two specimens which may represent opposite ends of the same bone; ^b may represent a male; ^c from Marsh 1872; ^d measured by the author—possibly the same as the specimen measured by Marsh; ^e includes one specimen from northern Florida not identified to subspecies.

† Measurements accurate only to within 0.5 mm.

* Slightly damaged specimen.

Table 20. Measurements (in mm) of the tarsometatarsus of male turkeys, with mean, standard deviation, observed range and sample size. See Fig. 7 for explanation of measurements.

	Total Length A	Proximal Width B	Least Width of Shaft C	Least Depth of Shaft D	Proximal End to Middle of Spur Core E	Top of Spur Core to End of Middle Trochlea F
<i>Proagriocharis kimballensis</i>	98 ^c	14 ^c	—	—	58	—
UNSM Coll. Loc. Ft-40	1	1			1	
<i>Meleagris progenes</i> , Rexroad	—	—	—	4.9 1	—	53.6 1
<i>Meleagris</i> cf. <i>M. progenes</i> , Benson	113.5	18.7	7.45 7.1–7.8	5.05 5.0–5.1	64.9	51.90 50.0–53.8
	1	1	2	2	1	2
<i>M. leopoldi</i> Cita Canyon	139.5	21.0	8.7	6.0	88.8	~56.9
	1	1	1	1	1	1
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> , Inglis IA	151.88 ± 3.88 146.6–158.0 8	22.06 ± 0.59 21.1–23.7 26	9.24 ± 0.44 8.4–9.9 26	5.95 ± 0.25 5.3–6.5 30	96.14 ± 2.92 91.6–101.1 14	59.82 ± 2.99 52.8–63.8 13
<i>Meleagris</i> sp. Coleman IIA	153.06 149.4–157.0 5	23.98 ± 0.30 23.6–24.5 8	9.60 ± 0.48 9.1–10.5 11	6.32 ± 0.21 6.0–6.7 13	90.87 86.5–96.3 6	67.04 59.7–70.4 7
<i>M. gallopavo</i> American Falls	165.5* 1	—	9.8 1	6.2 1	95.5* 1	74.4 1
<i>M. gallopavo</i> Ingleside	161.5	24.3*	9.4	6.2	94.50 93.0–96.0	72.5
	1	1	1	1	2	1
<i>M. gallopavo</i> Manalapan	176.5 ^e 1	23.35 23 ^e –23.7 ^f 2	—	—	110 ^e 1	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> , Santa Fe River IIA	—	—	8.9 1	6.1 1	98.3 1	67.8 1
<i>Meleagris</i> sp. Bradenton	—	23.8 1	—	—	—	—
<i>Meleagris</i> sp. Withlacoochee River	—	—	7.8 1	5.1 1	—	~65.8 1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	166.25* 161.5–171.0* 2	24.8 1	9.20 9.0–9.4 2	6.23 6.2–6.3 3	97.75* 97.2*–98.3 2	73.55 68.8–78.3 2
<i>Meleagris</i> cf. <i>M. gallopavo</i> Melbourne	—	23.9 1	—	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Sabertooth Cave	—	—	—	—	—	—
<i>M. gallopavo</i> Aucilla River	—	—	8.2 1	6.8 1	—	77.2 1
<i>M. gallopavo</i> Ichetucknee River	173.75 170.0–177.5 2	23.99 ± 0.89 22.3–25.3 8	8.90 ± 0.83 7.5–10.1 11	5.87 ± 0.40 5.2–6.7 19	103.23 101.0–106.7 3	73.16 ± 2.88 68.7–77.1 8
<i>Meleagris</i> sp. Kendrick IA	—	22.2 1	—	—	—	—
<i>M. gallopavo</i> Seminole Field	—	23.9* 1	9.0 1	5.75 5.7–5.8 2	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Bowman IA	—	—	8.6 1	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> , Santa Fe River IA	—	—	8.1 1	5.2 1	—	—
<i>M. gallopavo</i> Wacissa River	—	24.1* 1	9.2 1	—	103.1 1	—

Table 20. Continued.

Middle of Spur Core to End of Middle Trochlea G	Width of Spur Core H ^a	Length of Spur Core J ^b	Angle of Spur Core (in Degrees) K	Distal Width L	Depth of Inner Trochlea M	Depth of Middle Trochlea N	Depth of Outer Trochlea P
40 ^c 1	6.2 1	15.7* 1	38 ^c 1	—	—	—	—
48.0 1	7.1 1	—	49 1	19.0 1	8.4 1	9.1 1	9.9* 1
48.95 48.6–49.3 2	—	—	56 1	18.9 1	8.7 1	9.45 9.0–9.9 2	10.0 1
50.7 1	—	—	55.75 ^d 53.0–58.5 2	21.0 1	9.5 1	10.2 1	11.2 1
55.13 ± 3.12 48.3–59.6 13	7.70 ± 0.86 6.1–10.3 37	31.21* ± 2.78 26.2*–35.5* 15	47.4 ± 3.4 43–56 28	21.68 ± 0.52 20.9–22.7 15	9.56 ± 0.38 8.9–9.9 11	10.58 ± 0.37 10.0–11.1 20	10.88 ± 0.52 10.1–11.8 8
61.86 54.9–65.1 7	7.53 ± 0.50 7.0–8.2 9	28.82* 21.1*–32.4* 4	52.9 ± 4.0 45–58 10	23.75 ± 1.08 22.0–24.8 8	10.68 10.0–11.5 5	12.04 ± 0.30 11.7–12.5 8	12.98 12.0–13.9 5
70.0 1	7.0 1	17.4 1	50 1	26.0 1	—	12.1 1	13.1 1
68.5 1	6.70 6.5–6.9 2	—	55.0 55 2	23.5 1	10.0 1	10.8 1	12.0 1
66.5 ^e 1	—	—	—	—	—	—	—
62.9 1	5.8 1	—	58 1	—	—	10.6 1	—
—	—	—	—	—	—	—	—
~60.3 1	—	—	—	—	—	—	—
68.20 63.2–73.2 2	—	—	65 1	24.03 23.8–24.3 3	10.83 10.4–11.1 3	11.77 11.1–12.1	12.75 12.5–13.0 2
—	6.5 1	—	—	—	—	—	—
—	6.4 1	19.0* 1	—	—	—	—	—
68.2 1	6.1 1	20.0* 1	63 1	24.8 1	—	11.9 1	13.7* 1
68.55 ± 2.94 63.9–72.5 8	6.70 5.9–7.6 5	19.53* 16.1*–21.7* 3	57.1 ± 5.0 46–66 12	23.44 ± 1.50 21.1–26.2 9	10.13 9.3–11.0 6	11.38 ± 0.69 10.2–12.4 12	12.85 12.3–13.5 4
—	—	—	—	—	—	—	—
—	6.32 ± 0.68 5.1–7.5 12	16.60* 15.0*–17.9* 3	—	—	10.30 10.0–10.6 2	11.30 11.0–11.6 2	—
—	5.9 1	—	58 1	—	—	—	—
68.0 1	—	—	—	22.0 1	—	10.3* 1	—
—	6.1 1	17.3* 1	67 1	—	—	—	—

Continued

Table 20. Continued.

	Total Length A	Proximal Width B	Least Width of Shaft C	Least Depth of Shaft D	Proximal End to Middle of Spur Core E	Top of Spur Core to End of Middle Trochlea F
<i>M. gallopavo</i> Buffalo Site	168.0	24.72 ± 0.91	9.13 ± 0.47	6.25 ± 0.26	98.8	76.0
	1	22	27	27	1	1
<i>M. gallopavo</i> Hartman's Cave	—	—	—	—	—	—
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	160.55 ± 5.92 146.0–172.5 31	24.49 ± 1.13 22.3–27.3 32	9.34 ± 0.58 8.0–10.8 33	6.04 ± 0.39 5.2–6.9 32	91.48 ± 4.44 81.3–101.3 25	73.14 ± 3.59 65.4–78.0 25
<i>M. gallopavo osceola</i> , Florida	176.55 ± 8.51 166.5–192.5 10	23.11 ± 0.99 21.7–24.9 10	8.96 ± 0.68 8.1–9.9 10	5.94 ± 0.44 5.5–7.0 10	105.96 98.2–117.2 7	72.92 70.6–74.0 5
<i>M. gallopavo intermedia</i> , Texas	172.0 1	23.8 1	9.1 1	6.1 1	103.2 1	72.7 1
<i>M. gallopavo mexicana</i> , Chihuahua, Méx.	160.5 1	26.2 1	9.6 1	6.6 1	92.6 1	71.8 1
<i>M. gallopavo</i> Total skeletal specimens	164.53 ± 9.40 146.0–192.5 43	24.20 ± 1.25 21.7–27.3 44	9.26 ± 0.61 8.0–10.8 45	6.03 ± 0.40 5.2–7.0 44	94.84 ± 7.70 81.3–117.2 34	73.05 ± 3.22 65.4–78.0 32
<i>M. californica</i> Rancho La Brea	140.16 ± 4.79 130.6–149.5 50	22.05 ± 0.84 20.5–24.0 34	8.81 ± 0.34 8.1–9.7 45	5.81 ± 0.26 5.3–6.3 49	79.41 ± 3.81 69.7–86.9 49	64.62 ± 2.89 58.7–70.4 48
<i>M. californica</i> Carpinteria	141.60 140.5–144.0 5	22.32 22.1–22.5 5	8.74 ± 0.21 8.5–9.1 8	5.79 ± 0.19 5.6–6.0 8	81.26 80.3–82.7 5	64.77 62.8–66.5 7
<i>M. californica</i> Total specimens	140.29 ± 4.60 130.6–149.5 55	22.08 ± 0.78 20.5–24.0 39	8.80 ± 0.32 8.1–9.7 53	5.80 ± 0.25 5.3–6.3 57	79.58 ± 3.68 69.7–86.9 54	64.64 ± 2.72 58.7–70.4 55
<i>M. ocellata</i> Dzibilchaltún	140.0 1	20.0 1	7.8 1	5.10 4.9–5.3 3	84.6 1	60.9 1
<i>Meleagris</i> cf. <i>M. ocellata</i> Cancún Island	—	—	—	4.6 1	—	—
<i>M. ocellata</i> Mayapán	136.38 ± 4.96 128.0–145.5 17	22.56 ± 0.53 21.9–23.6 12	8.42 ± 0.50 7.5–9.0 15	6.05 ± 0.35 5.3–6.8 17	84.1 1	65.2 1
<i>M. ocellata</i> Yucatán, México and Petén, Guatemala	138.12 ± 4.41 130.2–146.0 14	20.36 ± 0.88 19.1–21.9 14	7.77 ± 0.57 6.3–9.0 14	5.30 ± 0.37 4.6–5.8 12	85.08 ± 3.86 78.6–91.0 13	58.20 ± 2.47 53.2–61.7 13
<i>M. crassipes</i> San Josecito Cave (spurred specimens only) ^a	108.30* 103.7–114.4 3	—	7.83 7.5–8.3 3	4.70 4.5–4.9 3	59.83* 57.8*–61.3* 3	54.15* 49.9*–58.4 2
<i>M. crassipes</i> San Josecito Cave (all specimens) ^b	102.68 ± 5.18 96.1*–114.4 10	17.85 17.5–18.2 2	7.51 ± 0.42 6.6–8.3 16	4.60 ± 0.21 4.0–4.9 15	59.83* 57.8*–61.3* 3	54.15* 49.9*–58.4 2

Table 20. Continued.

Middle of Spur Core to End of Middle Trochlea G	Width of Spur Core H ^a	Length of Spur Core J ^b	Angle of Spur Core (in Degrees) K	Distal Width L	Depth of Inner Trochlea M	Depth of Middle Trochlea N	Depth of Outer Trochlea P
70.15 69.2-71.1 2	6.62 ± 0.49 5.8-7.9 18	21.97* 19.2*-25.8* 7	60.8 ± 4.4 56-69 13	24.57 ± 0.80 23.1-25.8 13	11.27 ± 0.55 10.2-11.9 9	12.18 ± 0.54 11.2-12.9 18	12.91 ± 0.33 12.2-13.3 8
—	—	—	—	23.6 1	—	12.0 1	—
68.90 ± 3.12 62.1-73.2 27	6.64 ± 0.84 5.4-8.7 21	20.84 ± 2.52 16.8-24.9 14	61.7 ± 5.1 54-73 26	24.53 ± 1.08 21.9-26.6 33	10.90 ± 0.69 9.5-12.4 32	12.01 ± 0.44 10.8-13.0 32	12.85 ± 0.60 11.5-14.0 32
70.04 65.8-74.8 7	6.32 6.1-6.5 4	22.48 22.2-23.0 4	63.4 57-68 5	22.46 ± 1.19 20.2-24.1 10	10.18 ± 0.36 9.7-10.9 10	11.11 ± 0.55 10.1-11.9 10	12.08 ± 0.85 11.3-14.1 10
68.8 1	7.5 1	22.5 1	55 1	23.4 1	—	—	—
67.9 1	6.4 1	—	56 1	27.8 1	12.2 1	12.3 1	13.1 1
69.09 ± 3.05 62.1-74.8 36	6.61 ± 0.76 5.4-8.7 27	21.27 ± 2.27 16.8-24.9 19	61.6 ± 5.2 54-73 33	24.12 ± 1.49 20.2-27.8 45	10.76 ± 0.73 9.5-12.4 43	11.81 ± 0.60 10.1-13.0 43	12.68 ± 0.73 11.3-14.1 43
60.77 ± 2.82 55.7-66.5 49	5.94 ± 0.58 4.9-7.6 47	18.60* ± 2.16 14.9*-22.8* 31	61.2 ± 4.9 54-70 47	22.53 ± 0.74 20.9-24.6 46	10.00 ± 0.48 9.0-11.1 37	10.88 ± 0.38 10.1-11.6 43	11.74 ± 0.56 10.4-12.7 35
60.60 58.3-62.4 7	6.11 5.5-6.9 7	18.87* 15.3*-21.8 7	61.3 56-67 6	22.63 21.3-23.3 7	10.00 9.8-10.5 6	11.20 10.8-11.4 7	12.03 11.6-12.4 6
60.75 ± 2.67 55.7-66.5 56	5.96 ± 0.58 4.9-7.6 54	18.65* ± 2.13 14.9*-22.8* 38	61.2 ± 4.9 54-70 53	22.54 ± 0.73 20.9-24.6 53	10.00 ± 0.45 9.0-11.1 43	10.93 ± 0.37 10.1-11.6 50	11.79 ± 0.54 10.4-12.7 41
55.4 1	6.70 6.2-7.2 2	—	45 1	21.0 1	—	9.8 1	—
—	—	—	—	—	—	—	—
61.4 1	—	—	55 1	21.63 ± 0.87 20.2-22.9 15	—	10.90 10.7-11.1 2	—
54.41 ± 2.65 50.2-57.4 13	6.16 ± 0.67 4.8-7.3 11	27.25 ± 2.68 24.1-32.2 11	50.2 ± 4.6 43-58 13	19.91 ± 1.17 18.0-21.8 14	9.47 ± 0.64 8.1-10.4 11	9.81 ± 0.43 9.0-10.8 12	10.83 ± 0.72 9.1-12.0 12
48.47* 45.5*-54.0 3	7.0 1	12.6* 1	36 1	19.8 1	9.9 1	9.40* 8.8*-10.0 2	11.0 1
48.47* 45.5*-54.0 3	7.0 1	12.6* 1	36 1	18.70 18.2-19.8 4	9.33 8.8-9.9 3	8.93 8.3-10.0 6	10.38 9.9-11.0 4

^a Only relatively smooth adult spur cores considered; ^b only fully pointed spur cores considered; ^c from Martin and Tate 1970; ^d from A.H. Miller and Bowman 1956; ^e from Marsh 1872. Undoubtedly the same specimen as measured by Shufeldt 1915; ^f specimens measured by the author; ^g may include a specimen which represents a female; ^h probably includes specimens which represent females.

* Slightly damaged specimen.

Table 21. Measurements (in mm) of the tarsometatarsus of female turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 7 for explanation of measurements.

	Total Length	Proximal Width	Least Width of Shaft	Least Depth of Shaft	Distal Width	Depth of Inner Trochlea	Depth of Middle Trochlea	Depth of Outer Trochlea
<i>Rhegminornis calobates</i> ^a	—	8.1*	3.9	2.55	9.5	—	4.40*	—
Thomas Farm		1	1	2	1		2	
<i>Proagriocharis kimbballensis</i> , UNSM Coll. Loc. Ft-40	~78	12.95	5.05	3.5	—	—	—	—
	1	2	2	1				
<i>Meleagris progenes</i> , Rexroad	—	—	—	3.9	—	—	8.1	—
				1			1	
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> , Inglis IA	124.83*	17.38*	7.60	5.08	17.85	8.30	8.93	9.2
	123.0*–126.0	16.4*–18.1*	7.2–8.0	4.8–5.5	17.8–17.9	7.9–8.7	8.9–9.0	
	3	5	2	6	2	2	3	1
<i>Meleagris</i> sp. Coleman IIA	130.8	19.67	8.0	5.8	19.55	8.1	9.65	10.5
		18.4–20.5			19.2–19.9		9.6–9.7	
	1	3	1	1	2	1	2	1
<i>Meleagris</i> cf. <i>M. gallopavo</i> Carlisle Cave	—	18.1	6.8	4.8	18.1	8.6	8.9	9.7
		1	1	1	1	1	1	1
<i>M. gallopavo</i> Manalapan	—	19 ^b	—	—	—	—	—	—
		1						
<i>M. gallopavo</i> Ichetucknee River	136.80	20.76 ± 0.68	7.94	5.30	19.62	8.64	10.12	10.82
	135.1–139.7	20.0–22.1	7.7–8.8	4.9–5.9	18.0–21.1	8.2–8.9	9.6–10.7	10.3–11.7
	3	8	5	7	5	5	5	5
<i>M. gallopavo</i> Seminole Field	—	18.94	7.17	4.80	18.9	8.77	9.25	—
		18.1–20.2	7.1–7.3	4.6–4.9		8.5–9.0	9.1–9.4	
		5	3	5	1	3	2	
<i>Meleagris</i> cf. <i>M. gallopavo</i> Haile IIA	—	—	7.8	5.0	—	—	9.9	10.6
			1	1			1	1
<i>M. gallopavo</i> Nichol's Hammock	—	—	6.77	4.57	17.50	7.70	8.70	8.4
			6.5–7.0	4.4–4.7	17.0–18.1	7.2–8.2	8.5–9.0	
			3	3	3	2	3	1
<i>M. gallopavo</i> Buffalo Site, West Virginia	136.25	19.91 ± 0.99	7.42 ± 0.44	5.00 ± 0.29	19.87 ± 0.88	8.92 ± 0.58	9.68 ± 0.55	10.88 ± 0.50
	133.0–140.0	18.0–22.7	6.5–8.1	4.2–5.7	18.2–21.2	8.2–10.0	9.1–10.5	9.9–11.9
	4	15	21	31	15	10	17	13
<i>M. gallopavo</i> Hartman's Cave	—	—	—	—	—	—	9.8	—
							1	
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	126.90 ± 5.08	19.46 ± 0.63	7.32 ± 0.45	4.94 ± 0.19	19.72 ± 0.78	8.70 ± 0.51	9.60 ± 0.30	10.15 ± 0.54
	115.2–134.0	18.3–20.7	6.6–8.2	4.6–5.3	18.2–21.0	8.0–9.8	9.1–10.1	9.3–11.1
	19	20	20	19	20	20	20	20
<i>M. gallopavo osceola</i> Florida	131.68 ± 4.00	18.30 ± 0.67	6.96 ± 0.32	4.84 ± 0.11	17.76 ± 0.98	8.02 ± 0.46	8.98 ± 0.46	9.64 ± 0.54
	125.0–137.0	17.9–20.2	6.3–7.3	4.6–5.0	15.8–19.0	7.2–8.8	8.2–9.7	9.0–10.7
	11	11	11	11	11	11	11	11
<i>M. gallopavo mexicana</i> Chihuahua, México	134.90	21.55	7.65	5.40	21.85	9.90	10.20	11.15
	130.3–139.5	20.6–22.5	7.4–7.9	5.1–5.7	21.5–22.2	9.4–10.4	9.9–10.5	10.9–11.4
	2	2	2	2	2	2	2	2
<i>M. gallopavo</i> Total skeletal specimens ^c	128.74 ± 5.58	19.14 ± 1.09	7.21 ± 0.44	4.92 ± 0.24	19.15 ± 1.42	8.51 ± 0.70	9.41 ± 0.50	10.02 ± 0.64
	115.2–139.5	17.2–22.5	6.3–8.2	4.3–5.7	15.8–22.2	7.2–10.4	8.2–10.5	9.0–11.4
	33	34	34	33	34	34	34	34
<i>M. californica</i> Rancho La Brea	114.85 ± 3.92	18.36 ± 0.64	7.05 ± 0.32	4.84 ± 0.22	18.75 ± 0.61	8.44 ± 0.40	9.28 ± 0.38	9.98 ± 0.45
	105.7–122.3	17.5–19.8	6.5–7.6	4.5–5.3	17.6–19.9	7.9–9.4	8.4–10.0	9.2–10.9
	32	25	32	32	32	23	32	24
<i>M. californica</i> Carpinteria	116.00	18.88	7.15	4.95	19.20	8.62	9.62	10.12
	112.3–119.7	18.6–19.2	7.1–7.2	4.8–5.1	19.0–19.5	8.4–9.0	9.4–9.8	9.8–10.6
	2	4	2	4	4	4	4	4

Table 21. Continued.

	Total Length	Proximal Width	Least Width of Shaft	Least Depth of Shaft	Distal Width	Depth of Inner Trochlea	Depth of Middle Trochlea	Depth of Outer Trochlea
<i>M. californica</i>	114.92 ± 3.91	18.43 ± 0.63	7.05 ± 0.31	4.85 ± 0.21	18.80 ± 0.59	8.47 ± 0.38	9.32 ± 0.37	10.00 ± 0.44
Total specimens	105.7–122.3 34	17.5–19.8 29	6.5–7.6 34	4.5–5.3 36	17.6–19.9 36	7.9–9.4 27	8.4–10.0 36	9.2–10.9 28
<i>Meleagris</i> cf. <i>M. ocellata</i> Barton Ramie Site	—	17.4 1	—	—	—	—	—	—
<i>M. ocellata</i> Mayapán	121.50 120.5–122.5 2	20.60* 20.4*–20.8* 2	8.15 8.0–8.3 2	5.75 5.5–6.0 2	20.65 20.1–21.2 2	—	—	—
<i>M. ocellata</i> Yucatán, México and Petén, Guatemala	116.86 ± 4.14 111.9–124.5 11	16.98 ± 0.56 16.0–18.0 11	6.31 ± 0.35 5.8–7.0 11	4.56 ± 0.36 3.9–4.9 9	16.33 ± 0.97 14.5–17.8 11	7.97 ± 0.47 7.1–8.9 9	8.31 ± 0.35 7.9–9.0 9	9.32 ± 0.45 8.7–10.0 9
<i>M. crassipes</i> San Josecito Cave (unspurred specimens only) ^d	100.27* 96.1*–103.6 7	17.85 17.5–18.2 2	7.44 ± 0.41 6.6–8.2 13	4.58 ± 0.22 4.0–4.8 12	18.33 18.2–18.6 3	9.05 8.8–9.3 2	8.70 8.3–9.0 4	10.17 9.0–10.4 3

^a May represent a male; ^b from Marsh 1872; ^c includes one specimen from northern Florida not identified to subspecies; ^d may include some specimens which represent males.

* Slightly damaged specimen.

Table 22. Ratios (in percent) of the measurements of the tarsometatarsus of male turkeys, with mean, standard deviation, observed range, and sample size. See Fig. 7 for explanation of measurements.

	B/A	B/E	C/A	D/A	D/C	F/A
<i>Proagriocharis kimbballensis</i> , UNSM Coll. Loc. Ft-40	14.3 ^a 1	24.1 ^a 1	—	—	—	—
<i>Meleagris</i> cf. <i>M. progenes</i> , Benson	16.5 1	28.8 1	6.2 1	4.5 1	67.95 64.1–71.8 2	44.0 1
<i>M. leopoldi</i> Cita Canyon	15.0 1	23.6 1	6.2 1	4.3 1	69.0 1	~40.8 1
<i>Meleagris</i> cf. <i>M. leopoldi</i> or <i>M. anza</i> , Inglis IA	14.33 13.8–14.8 7	22.68 ± 0.85 21.1–23.6 12	6.00 ± 0.28 5.7–6.4 8	3.82 ± 0.28 3.2–4.1 8	64.40 ± 3.92 56.8–71.4 18	40.20 39.2–41.8 7
<i>Meleagris</i> sp. Coleman IIA	15.72 15.2–16.2 4	26.37 25.4–27.9 3	6.30 6.0–6.6 4	4.06 3.9–4.4 5	65.58 ± 2.12 61.9–68.5 9	44.10 39.5–46.6 3
<i>M. gallopavo</i> American Falls	—	—	5.9* 1	3.7* 1	63.3 1	45.0* 1
<i>M. gallopavo</i> Ingleside	14.1* 1	26.1* 1	5.8 1	3.8 1	66.0 1	44.9 1
<i>M. gallopavo</i> Manalapan ^c	13.0 1	20.9 1	—	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> , Santa Fe River IIA	—	—	—	—	68.5 1	—
<i>Meleagris</i> sp. Withlacoochee River	—	—	—	—	65.4 1	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> Reddick IB	15.4 1	25.2 1	5.55* 5.3*–5.8 2	3.75* 3.7*–3.8 2	68.00 66.0–70.0 2	44.20* 42.6–45.8* 2
<i>Meleagris</i> cf. <i>M. gallopavo</i> Sabertooth Cave	—	—	—	—	—	—
<i>M. gallopavo</i> Aucilla River	—	—	—	—	—	—
<i>M. gallopavo</i> Ichetucknee River	14.00 13.4–14.6 2	23.47 22.2–24.4 3	5.50 5.2–5.8 2	3.55 3.4–3.7 2	66.74 ± 4.68 63.0–77.3 9	42.25 42.1–42.4 2
<i>M. gallopavo</i> Seminole Field	—	—	—	—	—	—
<i>Meleagris</i> cf. <i>M. gallopavo</i> , Santa Fe River IA	—	—	—	—	64.2 1	—
<i>M. gallopavo</i> Wacissa River	—	23.4* 1	—	—	—	—
<i>M. gallopavo</i> Buffalo Site	14.8 1	25.2 1	5.4 1	3.8 1	69.11 ± 3.24 64.6–73.8 11	—
<i>M. gallopavo silvestris</i> , New York, Pennsylvania, Virginia	15.27 ± 0.72 13.8–16.7 31	27.11 ± 1.23 23.9–29.1 25	5.82 ± 0.41 5.0–6.6 31	3.76 ± 0.25 3.2–4.3 30	64.70 ± 3.06 58.8–74.7 32	45.59 ± 1.24 43.2–48.1 24
<i>M. gallopavo osceola</i> , Florida	13.10 ± 0.57 12.4–14.2 10	21.71 19.8–23.9 7	5.08 ± 0.38 4.5–5.7 10	3.40 ± 0.31 3.1–4.0 10	66.51 ± 5.55 59.1–77.8 10	41.78 39.6–43.5 5
<i>M. gallopavo intermedia</i> , Texas	13.8 1	23.1 1	5.3 1	3.5 1	67.0 1	42.3 1
<i>M. gallopavo mexicana</i> , Chihuahua, México	16.1 1	28.3 1	5.7 1	4.1 1	68.7 1	44.7 1
<i>M. gallopavo</i> Total skeletal specimens	14.75 ± 1.16 12.4–16.7 43	25.91 ± 2.59 19.8–29.1 34	5.64 ± 0.50 4.5–6.6 43	3.68 ± 0.31 3.1–4.3 42	65.25 ± 3.76 58.8–77.8 44	44.84 ± 1.94 39.6–48.1 31
<i>M. californica</i> Rancho La Brea	15.70 ± 0.62 14.5–17.1 34	27.85 ± 1.58 24.0–32.0 33	6.26 ± 0.21 5.9–6.7 45	4.13 ± 0.18 3.8–4.6 49	66.04 ± 2.84 60.2–74.1 45	46.11 ± 1.62 41.8–49.5 48

Table 22. Continued.

G/A	H/J	J/A	K/A	L/A	M/A	N/A	P/A
40.8 ^a 1	39.5* 1	16.0* ^{a,b} 1	38.8 ^a 1	—	—	—	—
42.8 1	—	—	—	16.6 1	7.7 1	7.9 1	8.8 1
36.3 1	—	—	—	15.0 1	6.8 1	7.3 1	8.0 1
36.74 35.6–38.5 7	25.68* ± 1.83 23.2–29.0 14	20.35* 18.5*–22.2* 6	31.98 28.9–35.1 6	14.26 13.7–14.8 7	6.24 5.9–6.7 5	6.86 ± 0.31 6.4–7.3 8	6.96 6.7–7.3 5
40.47 36.3–43.1 3	27.10* 22.0*–34.1* 4	17.85* 14.0*–21.7* 2	36.45* 33.7*–38.4 4	15.50 14.8–15.8 4	6.7 — 1	7.75 7.6–7.9 2	8.1 — 1
42.3* 1	40.2 1	10.5* 1	30.2* 1	15.7* 1	—	7.3* 1	7.9* 1
42.4 1	—	—	34.0 1	14.6 1	6.2 1	6.7 1	7.4 1
37.7 1	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
40.95* 39.1–42.8* 2	—	—	38.0* 1	14.40* 13.9*–14.9 2	6.45* 6.4–6.5* 2	7.00* 6.9–7.1* 2	7.65* 7.3*–8.0 2
—	33.7* 1	—	—	—	—	—	—
—	30.5* 1	—	—	—	—	—	—
39.95 39.9–40.0 2	36.5* 1	9.1* 1	36.85 36.5–37.2 2	13.65 13.3–14.0 2	6.00 5.5–6.5 2	6.95 6.6–7.3 2	7.40 6.9–7.9 2
—	38.40* 36.1*–40.0* 3	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	35.3* 1	—	—	—	—	—	—
41.2 1	30.90* 27.0*–33.8* 7	—	33.3 1	—	7.0 1	7.4 1	—
42.92 ± 1.29 40.8–45.2 25	32.09 ± 3.08 28.7–40.0 13	12.82 ± 1.35 10.4–14.7 14	38.57 ± 3.54 33.3–45.3 25	15.32 ± 0.69 13.6–16.9 31	6.81 ± 0.37 6.2–7.5 30	7.51 ± 0.31 6.8–8.2 30	8.02 ± 0.40 6.8–8.8 30
39.81 37.3–43.2 7	28.15 27.5–28.4 4	13.05 13.0–13.2 4	36.28 32.8–40.0 5	12.72 ± 0.57 11.8–13.4 10	5.77 ± 0.25 5.2–6.1 10	6.28 ± 0.20 5.9–6.5 10	6.85 ± 0.51 6.4–8.1 10
40.0 1	33.3 1	13.1 1	32.0 1	13.6 1	—	—	—
42.3 1	—	—	34.9 1	17.3 1	7.6 1	7.7 1	8.2 1
42.18 ± 1.92 37.3–45.2 34	31.28 ± 3.12 27.5–40.0 18	12.88 ± 1.15 10.4–14.7 19	37.89 ± 3.67 32.0–45.3 32	14.72 ± 1.35 11.8–17.3 43	6.58 ± 0.58 5.2–7.6 41	7.22 ± 0.61 5.9–8.2 41	7.74 ± 0.66 6.4–8.8 41
43.35 ± 1.60 39.2–46.6 49	33.18* ± 3.76 27.6*–46.0* 31	13.18* ± 1.48 10.2*–15.3* 31	43.68 ± 3.59 37.4–52.1 47	16.11 ± 0.42 15.0–16.9 46	7.10 ± 0.30 6.4–7.7 37	7.76 ± 0.27 7.2–8.3 43	8.35 ± 0.37 7.5–9.0 35

Continued

Table 22. Continued.

	B/A	B/E	C/A	D/A	D/C	F/A
<i>M. californica</i>	15.78	27.58	6.25	4.16	66.31	45.62
Carpinteria	15.5–16.0	27.3–27.8	6.0–6.5	4.0–4.3	63.6–69.8	44.5–46.2
	4	4	4	5	7	5
<i>M. californica</i>	15.71 ± 0.59	27.82 ± 1.49	6.26 ± 0.21	4.13 ± 0.17	66.08 ± 2.74	46.06 ± 1.56
Total specimens	14.5–17.1	24.0–32.0	5.9–6.7	3.8–4.6	60.2–74.1	41.8–49.5
	38	37	49	54	52	53
<i>M. ocellata</i>	14.3	23.6	5.6	3.8	67.9	43.5
Dzibilchaltún	1	1	1	1	1	1
<i>M. ocellata</i>	16.71 ± 0.61	—	6.15 ± 0.33	4.44 ± 0.18	71.87 ± 2.76	44.8
Mayapán	15.6–17.5		5.5–6.6	3.9–4.7	68.2–76.2	
	12		15	17	15	1
<i>M. ocellata</i>	14.74 ± 0.59	23.99 ± 1.28	5.61 ± 0.31	3.82 ± 0.18	68.30 ± 3.83	41.97 ± 1.99
Yucatán, México	13.9–15.9	22.3–26.6	4.8–6.2	3.5–4.1	61.1–73.4	38.2–45.2
and Petén, Guatemala	14	13	14	12	12	13
<i>M. crassipes</i>	—	—	7.20*	4.33*	60.00	49.55*
San Josecito Cave			7.0*–7.4	4.2*–4.5	59.0–61.0	48.1*–51.0
(spurred specimens only)			3	3	3	2
<i>M. crassipes</i>	17.55	—	7.40* ± 0.33	4.55* ± 0.20	61.55 ± 3.15	49.55
San Josecito Cave	16.9–18.2		7.0*–8.0*	4.2*–4.9*	54.8–66.7	48.1*–51.0
(all specimens)	2		10	10	15	2

Table 22. Continued.

G/A	H/J	J/A	K/A	L/A	M/A	N/A	P/A
42.58	32.57*	13.12*	44.80	16.22	7.13	7.88	8.62
41.3–43.3	26.9*–35.9*	10.8*–15.4*	39.6–47.7	16.0–16.5	7.0–7.3	7.7–8.0	8.3–8.8
5	7	4	4	4	3	4	4
43.28 ± 1.56	33.07 ± 3.63	13.17* ± 1.51	43.77 ± 3.56	16.12 ± 0.40	7.10 ± 0.29	7.77 ± 0.26	8.38 ± 0.36
39.2–46.6	26.9*–46.0*	10.2*–15.4*	37.4–52.1	15.0–16.9	6.4–7.7	7.2–8.3	7.5–9.0
54	38	35	51	50	40	47	39
39.6	—	—	32.1	15.0	—	7.0	—
1			1	1		1	
42.2	—	—	37.8	15.84 ± 0.66	—	7.75	—
1			1	14.5–16.8		7.4–8.1	
				15		2	
38.67 ± 1.67	22.90 ± 2.64	19.64 ± 1.80	36.22 ± 3.89	14.40 ± 0.56	6.82 ± 0.38	7.08 ± 0.21	7.82 ± 0.43
36.1–41.4	19.2–27.9	17.3–23.1	29.4–43.6	13.3–15.1	6.2–7.3	6.8–7.5	7.0–8.6
13	9	11	13	14	11	12	12
44.67*	55.6*	11.0*	31.5	17.3	8.6	8.60	9.6
42.6*–47.2						8.5–8.7	
3	1	1	1	1	1	2	1
44.67*	55.6*	11.0*	31.5	17.83	8.70	8.62	9.80
42.6*–47.2				17.3–18.6	8.6–8.8	8.4–9.0	9.6–10.2
3	1	1	1	3	2	5	3

^a Based on at least one measurement of Martin and Tate 1970; ^b based on different individuals (UNSM 20036, 20038); ^c from measurements of Marsh 1872; ^d may include one or more specimens which represent females.

* Slightly damaged specimen.